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SECTOR REFORM AND UTILITY COMMERCIALIZATION (SRUC)

Background Report on Zambia's Power Sector: IPP Programs

June 2015

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**SECTOR REFORM AND
UTILITY
COMMERCIALIZATION
(SRUC) PROJECT
BACKGROUND REPORT ON
ZAMBIA'S POWER SECTOR:
IPP PROGRAMS**

JUNE 2015

SECTOR REFORM AND UTILITY COMMERCIALIZATION
(SRUC) PROJECT
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INTRODUCTION

USAID's **Sector Reform and Utility Commercialization Program (SRUC)** aims to enhance the financial viability and long term sustainability of developing countries' electricity systems, thereby enabling their expansion and establishing the necessary preconditions for clean energy investments.

USAID wishes to use the SRUC Task Order to provide support to the power sectors of Zambia, Mozambique and/or Namibia. In August 2015, USAID and SRUC advisors will carry out a scoping mission to each of the three countries to gain a more complete understanding of the current state of their respective electricity sectors. This scoping trip will provide information that can be used to design an effective SRUC technical assistance program that will reduce system losses and/or facilitate IPP program design and implementation.

This *Background Report* has been written to provide USAID and the SRUC team with easily accessible information prior to their departure on the scoping trip. The document provides insights into the Zambia power sector, focusing on recent and current efforts to improve utility performance and reduce losses. The Report is structured as follows:

- (a) Background information on the operations of the power sector, including any relevant information on technical and commercial losses, loss reduction analyses and strategies, previous approaches to slum and rural electrification and current thinking on best practices and areas of improvement in loss reduction activities.
- (b) To the extent desk research has allowed, detailed information on key performance indicators such as estimates for electricity access rates, technical and non-technical losses, collection rates and subsidies.
- (c) A review of other international donors' work in loss reduction in order to explore potential areas of collaboration, and reduce potential overlap.

Before this, we provide a little information on Zambia's economic profile. Throughout, the reader should note that the authors have not been able to confirm that all data and information included is accurate.

OPERATIONS OF THE POWER SECTOR

Economy & Population

Zambia is a Southern Africa Development Community (SADC) member state with a population of nearly 14 million people (5% of total SADC population), an average growth rate of 2.9% and a current urbanization rate of 3.2%. The population is 36% rural, with about 67% of the rural population living in extreme poverty. Economic growth in Zambia has been strong over the last decade, ranging between 6% and 10% between 2003 and 2013, driven by robust activities in the mining, agriculture, manufacturing, construction, transport and communications sectors. This represents a significantly stronger performance than the average growth posted by SADC countries. Estimated gross domestic product (GDP) in 2011 was US\$22.6 billion, translating to a per capita GDP of US\$1,600.¹ The main contributor of GDP is the service sector, which accounts for 70%, followed by the agriculture sector with 20% and the mining and manufacturing sector with 10% (African Economic Outlook (AEO), 2013).

The energy sector as a whole is dominated by biomass, making up over 80% of supply and 70% of demand.² While noting the country has several cross border power interconnects for

¹ IRENA Renewables Readiness Assessment 2013.

http://www.irena.org/documentdownloads/publications/rra_zambia.pdf

² http://www.irena.org/documentdownloads/publications/rra_zambia.pdf

power wheeling in the region, petroleum is the only energy source imported into Zambia. The country has substantial unexploited reserves of hydropower, coal, and biomass.³ Zambia has an estimated total hydro power capacity of around 6,000 MW, yet only 1,948 MW have been installed in the country to date. These power plants represent 94% of the total installed capacity, and 99% of the total electricity generated in the country.

Like most of Africa, Zambia is currently battling an electricity supply deficit and suffers very low electrification rates. Although higher than several of its SADC member peers, such as Malawi, Madagascar and DRC, only 22%⁴ of Zambia's population has access to electricity in 2014, being 45% in urban and 10% in rural areas. Zambia hopes to reach 90% and 51% access by 2030 in urban and rural areas, respectively.⁵

Electricity Sector Structure & Key Participants

The Zambian Ministry of Mines, Energy and Water Development (MEWD) is the ministry responsible for setting energy sector policy and providing guidance through one of its six departments, the Department of Energy. Within the Department of Energy there are three dedicated units of particular interest to this background report. This includes the Zambian Gender and Energy Network which is involved in the advancement of gender concerns in energy policy.⁶ Also within the Department of Energy is the Office for the Promotion of Private Power Investors (OPPI), which works directly with private investors and seeks to provide support for the projects within the ministry.⁷ Finally, the Energy Sector Advisory Group contains representatives from government ministries and authorities, development agencies, and commercial enterprises. The group works to encourage cooperation on energy policy, and provide expert opinion on energy matters to government officials involved in policy design⁸. The Rural Energy Authority (REA) also plays a role in developing policies and projects which expand access to electricity throughout the country.

The Energy Regulation Board (ERB) was created under the Energy Regulation Act of 1995, and is responsible for regulating all forms of energy, including electricity. The ERB regulates returns on investment for operators/utilities, the licensing of operators, the setting of tariffs and the monitoring of competition in the market. The ERB reports directly to the MEWD.

The Zambian electricity supply industry is composed primarily of three major players: ZESCO, the state owned vertically integrated generator, transmitter, and distributor, which dominates the power sector and accounts for the majority of activity; Copperbelt Energy Corporation Plc (CEC), a privately owned (floated on the Lusaka stock exchange) power transmission and electricity distribution company that purchases electricity from ZESCO and delivers it to the mining industry based on the Copperbelt, CEC is also a member of the Southern Africa Power Pool (SAPP); and the Lunsemfwa Hydro Power Company (LHPC), an IPP which generates approximately 57 MW of power for sale primarily to ZESCO, and is also the sole IPP to hold a license to trade power on SAPP.

Figure 1 below presents a schematic of the Zambian power sector.

³ Energy: Sector Profile, Zambia Development Agency

⁴ Source: International Energy Agency (IEA), World Energy Outlook 2014

⁵ http://www.irena.org/documentdownloads/publications/rra_zambia.pdf

⁶ REEGLE website, <http://www.reegle.info/policy-and-regulatory-overviews/ZM>

⁷ Engineering News Website, <http://www.engineeringnews.co.za/print-version/investment-in-zambia-power-generation-critical-for-continued-growth-2013-04-10>

⁸ REEGLE website, <http://www.reegle.info/policy-and-regulatory-overviews/ZM>

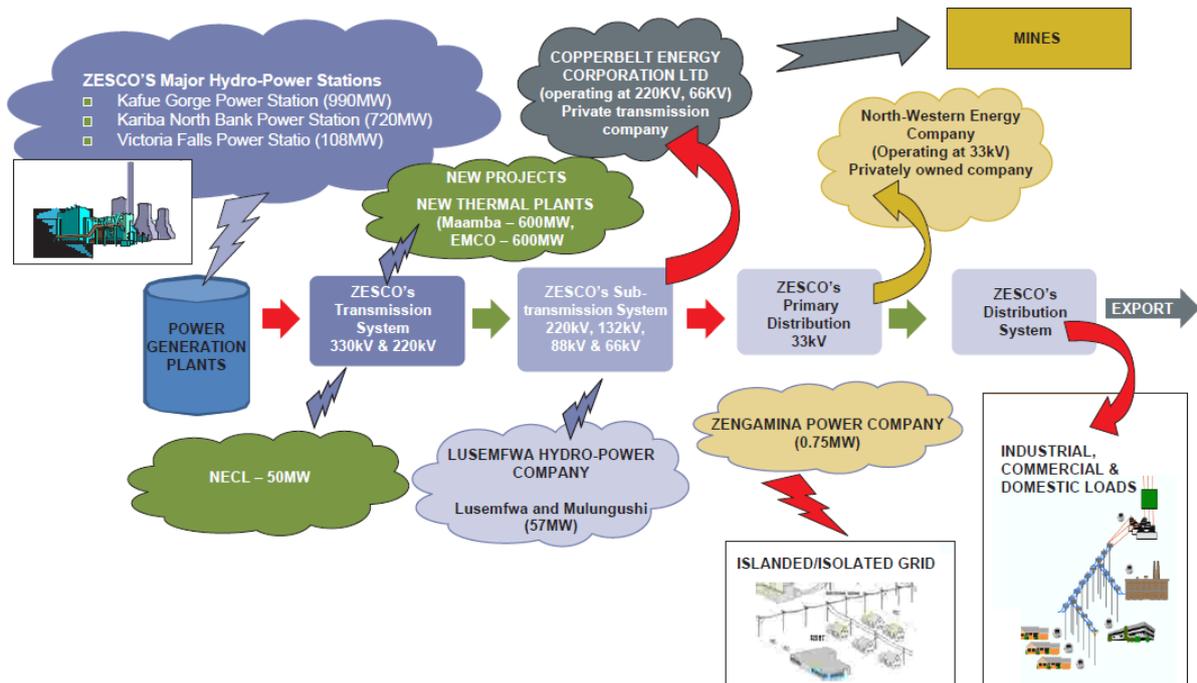


Figure 1: Electricity Supply Industry in Zambia⁹

ZESCO is held publicly and in its entirety by the government of Zambia. The Permanent Secretaries of the Ministry of Finance and National Planning, and the MEWD represent the Government on the Board. ZESCO Limited's electricity is 99% hydro with the remaining one percent being from diesel powered generators, with 50% of the customer base being represented by the mining industry. There is a dearth of data on the company's performance released by ZESCO; some data on generation, transmission, and distribution was released by the ERB in 2009,¹⁰ and the Regional Electricity Regulators Association of Southern Africa (RERA), of which the ERB is a member, released a report in 2015 that includes more recent power sector indicators. Also of interest, the ERB commissioned a Cost of Service Study in 2013 of the entire electricity supply industry to determine the cost of providing power to different categories of consumers,¹¹ as an update of a study that was completed in 2007.¹²

Copperbelt Energy Corporation (CEC) delivers 50% of all electricity consumed in Zambia. CEC owns and operates significant transmission assets, including an interconnect with the Democratic Republic of the Congo and 1,000 km of other transmission lines. CEC also owns and operates a small gas turbine electricity generator in Zambia, making claim to only 80 MW of generation which CEC uses to supply its own customers.¹³

The Lunsemfwa Hydro Power Company was the first IPP in Zambia, and is split between Agua Imara with a 51% stake and the previous owners Wanda Gorge Investments at 49%. The company operates two hydro power plants, with a combined generation capacity of 56 MW.

Power generation in Zambia is dominated by ZESCO, which controls 93.8% of the generation capacity, the vast majority of that generation begin produced from hydropower.

⁹ ERB Report, <http://www.erb.org.zm/reports/EnergySectorReport2012-2013.pdf>

¹⁰ ERB Electricity Sector Brief, <http://www.erb.org.zm/downloads/eregulation/zescotariffs/DescriptionoftheZambiaElectricitySystem.pdf>

¹¹ ERB Filing, <http://www.erb.org.zm/press/statements/CostOfServiceStudy.pdf>

¹² ERB Filing, <http://www.erb.org.zm/downloads/CostOfServiceStudyReport.pdf>

¹³ CEC Annual Report 2014, <http://cecinvestor.com/investor/annual-reports/>

Power Station	Installed Capacity (MW)	Type of Generation	Owner / Operator
Kafue Gorge	990	Hydro	ZESCO
Kariba North Bank	1080	Hydro	ZESCO
Victoria Falls	108	Hydro	ZESCO
Combined Small Hydro	25	Hydro	ZESCO
Isolated Generation	8	Diesel	ZESCO
Lusemfwa and Mulungushi	56	Hydro	Agua Imara, Wanda Gorge
Gas Turbine	80	Diesel	CEC

Source: Energy: Sector Profile, Zambia Development Agency

The two largest generation assets in Zambia are the Kariba North Bank and the Kafue Gorge power station.

The Kariba North Bank dam and consequently the Kariba South Power Station were constructed between 1956 and 1962.¹⁴ As the plant was aging, rehabilitation work on this plant began in 2000. To ensure the final two generation units would be rehabilitated, in 2005, the European Investment Bank (EIB) loaned US\$9.37 million along with a US\$15.4 million loan from Development Bank of Southern Africa. Following those financings, in February 2007 the government of China lent US\$300 million for the same purpose, and work was completed in 2009.¹⁵

Kafue Gorge power station's first generating unit was commissioned in 1971 and the project was completed in 1973. The power station's initial capacity was 600 MW and has since been increased to 990 MW.¹⁶ Civil and turbine rehabilitation work began in 2001 on Kafue Gorge. In 2002, ZESCO awarded a US\$17 million contract to a number of entities to rehab the stations generators. In March 2009, ZESCO reported rehabilitation and uprating of Kafue Gorge was complete extending the life span of the power station by 20 to 30 years.¹⁷

Transmission in Zambia is operated by two major entities, ZESCO and CEC. ZESCO is the sole owner of the 330 kV nationwide system spanning 2310 km, while the CEC has a more localized transmission system within the Copperbelt region to serve mining needs. The two systems are operated the control center of each respective entity. There are six cross-border line connections comprised of two connections to Zimbabwe, and one each to the Congo, Botswana, Tanzania, and Namibia. Transmission losses in ZESCO's system are relatively low, with an average around 4.1%.¹⁸

Little information exists on the distribution network within Zambia as it is wholly controlled by ZESCO, and the company has not released a financial or operational report in some years. The most recent information from 2009, indicates the distribution system is broken into 4 divisions, with 4 regions in each division. Losses over the 2009 year ranged from a high of

¹⁴ ZESCO Website, <http://www.zesco.co.zm/AboutUs.html>

¹⁵ Hydroworld Website, <http://www.hydroworld.com/articles/print/volume-17/issue-5/Articles/refurbishment-renewing-veteran-assets-and-securing-new-megawatts-in-zambia-and-nicaragua.html>

¹⁶ ZESCO Website, <http://www.zesco.co.zm/AboutUs.html>

¹⁷ Hydroworld Website, <http://www.hydroworld.com/articles/print/volume-17/issue-5/Articles/refurbishment-renewing-veteran-assets-and-securing-new-megawatts-in-zambia-and-nicaragua.html>

¹⁸ Energy: Sector Profile, Zambia Development Agency

27%, to a low of 15% with an average around 22%. No explanation was given for the variability in the distribution loss figures.¹⁹

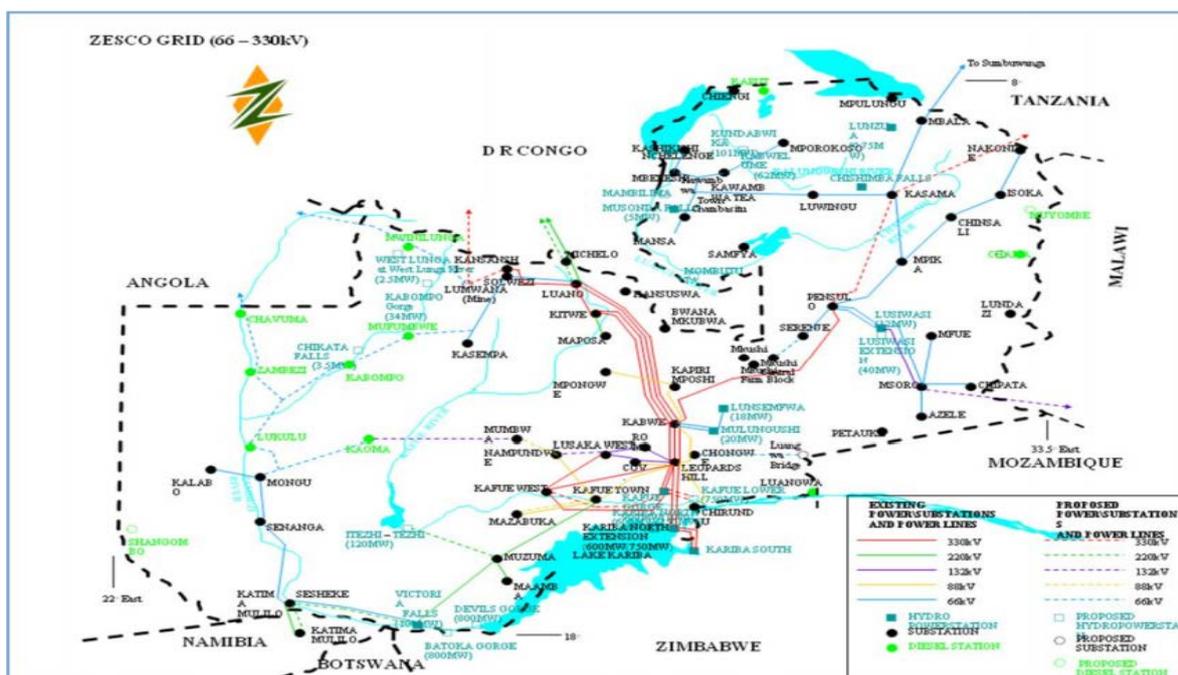


Figure 1. ZESCO Grid Transmission System

Source: Ministry of Energy and Water Development, 2008

New Energy Sector Projects

ZESCO has three significant power generation projects it hopes to bring online soon, totaling 1,230 MW. The Kariba North Bank Extension is a project financed by the China Exim Bank and the Development Bank of Southern Africa to expand the capacity of the existing Kariba North Bank Power Station to 360 MW.²⁰ The Itzhi-Tezhi Hydro Power Project is a 120 MW base load power plant and a 280 km transmission line to connect the power station to the national grid.²¹ The Kafue Gorge Lower Project is a hydro power station with a projected installed capacity of 750 MW, which would significantly increase Zambia's power presence in the southern African region.

The Rural Electrification Authority (REA) has a number of initiatives aimed at increasing the use of solar energy. The group is currently in the process of developing a 60 kW solar mini-grid to supply a community of approximately 50 households.²² Under a build-own-operate (BOO) model, the government of Zambia has reviewed various institutions wishing to develop a total of 30 MW solar photovoltaic around the country.²³

Wind energy potential in Zambia is thought to be relatively low, yet the Department of Energy has plans to develop a wind chart of the nation to identify potentially viable locations.

Zambia has more than 80 hot springs. The springs are generally perceived as being cost prohibitive, and have largely not been tapped for industrial or energy provision. Currently

¹⁹ Energy: Sector Profile, Zambia Development Agency

²⁰ SinoHydro Website,

<http://eng.sinohydro.com/index.php?m=content&c=index&a=show&catid=42&id=133>

²¹ EU Africa Infrastructure Website, <http://www.eu-africa-infrastructure-tf.net/activities/grants/itezhi-tezhi-hydro-power-and-transmission-line-project.htm>

²² MEWD Website, <http://www.mewd.gov.zm/index.php>

²³ IRENA Report, http://www.irena.org/documentdownloads/publications/rra_zambia.pdf

only one small geothermal generation plant is partially operational. ZESCO is considering reviving the plant²⁴.

Electricity Sector Laws

The Electricity Act of 1995, subsequently amended in 2003, was formulated to regulate the generation, transmission and distribution of electricity in Zambia. The act created the Energy Regulation Board by outlining its tasks and authorities in energy sector regulation.

The Rural Electrification Act of 2003 established the REA and instituted a Rural Electrification Fund which the REA could use. Additionally, the REA was made accountable for realizing the Rural Electrification Master Plan (REMP) through formation and monitoring of rural electrification organizations or companies.

In 2013, the Zambia Grid Code was implemented hoping to facilitate open and non-discriminatory access to the transmission system in order to ensure a more liberalized electricity sector, through increased efficiency and faster paced electrification.

Electricity Regulatory Environment

The ERB currently uses a “Revenue Requirement” pricing method to regulate tariffs of electricity utilities. Revenue requirement is calculated by taking the sum of all operating expenses and adding the “Rate Base” multiplied by the rate of return. The “Rate Base” is the amount of capital or assets ZESCO assigns to providing service. Rate of return is equivalent to the cost of capital.

The ERB determines the corresponding rate of increase to the tariff that will enable ZESCO to generate the approved revenue requirement. This rate of increase is then applied by ZESCO to its existing tariffs.

If ZESCO wishes to change the tariff, it can apply to the ERB for a review under the Automatic Tariff Adjustment Formula (ATAF). This process is reserved for major macroeconomic shocks such as significant currency depreciation or inflation.²⁵

Zambia Utility Financial Position

ZESCO’s financial position is difficult to get specific information on, as they do not release financial statements or annual reports. However, one can infer from the country’s tariff rates and the costs associated with ZESCO’s generation profile that the utility is not financially sustainable. The ERB’s 2014 tariff filing targeted a price increase of 24.63% for residential customers and 15.38% for commercial customers over four years on the principal of “recovery of prudently incurred cost by the utility”.²⁶ These increases will raise the price of electricity to \$0.04/kWh for residential (101-300 kWh) and commercial customers. ZESCO’s national average tariff stands at \$0.06/kWh. The AICD estimated that ZESCO’s long-run marginal cost for power is \$0.08/kWh, and that the utility recovered only 39.1% of the full cost of electricity service.²⁷

ZESCO has the second-lowest electricity tariffs in the SAPP. While hydropower generation keeps the long-run marginal cost for power lower than many of its SAPP neighbors, Zambia’s dams are old and in need of continued maintenance. These artificially-low tariffs create financial difficulties for the utility, leading to negative operating margins, and contribute to the deterioration of ZESCO’s financial stability. Aside from non-cost-reflective

²⁴ Energy Sector Profile, Zambia Development Agency

²⁵ ERB Website, <http://www.erb.org.zm/content.php?viewpage=epris>

²⁶ ERB, ZESCO Tariff Filing 2014, June 1, 2014

²⁷ AICD, “Zambia’s Infrastructure: A Continental Perspective”, March 2010

tariffs, ZESCO suffers from aggregate technical and commercial (ATC) losses hovering around an estimated 20% every year, which further eat into the company's cash flow.²⁸

IPP PROCUREMENT PROGRAM

Current IPP Strategy

There are a number of agencies which have overlapping jurisdictions in the facilitation of IPP projects without a unified IPP procurement and implementation strategy.

The Zambian Development Agency Act of 2006 (amended 2012) provides for the establishment of an agency tasked with formulating investment promotion strategies. Small hydropower generation projects are included in the original schedule of priority areas of the act, which may be expanded as directed by the Minister of Finance by statutory instrument. According to the ZDA website, reducing the cost of power generation projects and attracting independent power producers to increase generation capacity was a priority area for the ZDA. Investments in priority areas are granted favorable tax treatment and dedicated additional government resources according to the act.²⁹

The Ministry of Energy and Water Development sets the policy for the sector. The National Energy Policy of 2007 outlines the goals of "creating consumer and investor confidence ... [and]... enhancing economic competitiveness and efficiency in energy production."³⁰ The policy does not mention private investment in the power sector.

The Zambia Office for Promoting Private Power Investment (OPPPI), an arm of MEWD, is responsible for implementing the government's policy and facilitating IPP investments.³¹ The OPPPI also acts to promote private-sector involvement in electricity generation and transmission. The OPPPI was set up to reduce the complexity of procedures, rules and regulations usually associated with obtaining the required approvals, permits and licenses for investors in the electricity sector. Its mandate includes solicitation and evaluation of proposals, negotiation and awarding of contracts, and finalization of the implementation agreement, as well as representing the interests of government and co-ordination with other government agencies.

Unfortunately, we could not locate publically available documentation from the OPPPI that represents a statement of strategic vision or basic functions, or published guidelines for navigating the various stages of the procurement process. Reports from various donor groups, most notably from the USAID-funded Assistance to Zambia OPPPI, cited that the agency "lacks many of the logistical and basic office resources which would help it operate more effectively," going on to state that the office lacked the human, institutional, and technological capacity for project facilitation.³²

As a result of the Electricity Act of 1995 and subsequent Electricity Regulation Act, the ERB has jurisdiction to license privately-held electricity generation, transmission, and distribution entities. The ERB states that a major function of their regulatory activities is designed to promote competition and investment within the energy sector.³³

²⁸ ERB Energy Sector Report 2013, <http://www.erb.org.zm/reports/EnergySectorReport2012-2013.pdf>

²⁹ ZDA Act and Amendment <http://faolex.fao.org/docs/pdf/zam97277.pdf>, http://www.parliament.gov.zm/sites/default/files/documents/amendment_act/ZDA%20%28Amendment%29.PDF

³⁰ Zambia National Energy Policy 2007, http://www.unredd.net/index.php?option=com_docman&Itemid=134&view=download&alias=318-final-draft-national-energy-policy-3-feb-2007-318&category_slug=policies-and-legislations-432

³¹ During the researching and writing of this report the OPPPI's website was down.

³² USAID AZOPPI Project Report, http://pdf.usaid.gov/pdf_docs/pdabu882.pdf

³³ ERB Website, <http://www.erb.org.zm/content.php?viewpage=ecre>

Current IPP Framework

Traditional Energy – Fossil Fuels

Zambia is a net importer of fossil fuels. ZESCO generates less than 1% of its installed capacity (8 MWs) with isolated diesel generation on microgrids. Compared to the abundant, low-marginal-cost hydropower (which was financed and built prior to the formation of the modern Zambian state), utility-scale fossil fuel power plants have not proven to be viable. The one exception to this is the 80 MW of standby gas generators that CEC operates as backup generators when ZESCO cannot supply adequate power to meet the mines' needs.

Despite Zambia's proven coal reserves (estimated 80 mn tonnes), there are no coal-fired power plants currently operating within Zambia. The first coal-fired plant in Zambia will be an IPP operated by Maamba Collieries Limited (MCL), the owner and developer of one of Zambia's largest coal deposits. The PPA for this project, which will sell 265.5 MW to ZESCO and use the rest of the 300MW capacity for mining operations for 20 years, was signed in August 2011.³⁴ Bloomberg reports that the project, with financing from the AfDB and total estimated costs of US\$800 M, was set to begin power production in October 2014, but the company is seeking exemption from the provision of the Electricity Act of 1994 which would force the company to bill in local currency.³⁵

Renewables

Zambia does not currently have a renewable energy development policy. There is insufficient detail in the National Energy Policy (2008) and relevant electricity legislation to determine that the Zambian government has the mechanisms or capacity to facilitate renewable energy IPPs. Despite adequate solar exposure, there is one project in the pipeline for utility-scale PV. There are currently donor-funded programs in Zambia geared towards promoting solar PV for facilities of commercial and institutional buildings, including schools, clinics, and housing developments. Much of Zambian territory does not exhibit wind speeds that would suit electricity generation projects, however some zones for utility-scale wind farms may exist.³⁶ ESMAP and Zambia have commenced a mapping project to explore the geographical distribution of renewable energy resources.³⁷ When these maps are finalized, the GRZ would do well to publish them along with a formalized policy for developing potentially-feasible wind and solar sites through IPPs.

Legal & Organizational Structure around Power Purchase

There are two types of power purchase agreements that are currently operational within the Zambian energy sector. ZESCO and CEC have a bulk supply agreement (BSA) which allows for CEC to purchase pre-determined amounts of electricity from ZESCO at regulated transmission prices. ZESCO and CEC also enter into power supply agreements (PSAs) with industrial and commercial customers at regulated distribution prices. Domestic power purchases must take place in Zambian Kwacha.

Current Players and Projects

- Aguai Mara (LHPC) is owned by Norwegian government entities SN Power AS, Norfund, and BKK. They operate the Lunsemfwa (24 MW) and Mulungushi (28.5 MW) HPPs. They have the rights to develop the Lunsemfwa extension (55MW) and Mkushi (65MW) HPPs. According to the developer's website, a number of pre-

³⁴ ERB Website, <http://www.erb.org.zm/press/statements/MaambaZescoPPA.pdf>

³⁵ Bloomberg, <http://www.bloomberg.com/news/articles/2013-10-09/zambian-coal-miner-to-finalize-560-million-of-power-plant-loans>

³⁶ ERB Energy Sector Report 2013, <http://www.erb.org.zm/reports/EnergySectorReport2012-2013.pdf>

³⁷ ESMAP Website, http://www.esmap.org/RE_RESOURCE_MAPPING_zambia

feasibility studies have been undertaken at these sites. The company is negotiating the implementation agreement with Zambia.³⁸

- Lunzu Power Authority, a Chinese-owned company, has completed the construction of the US\$52 million 14.8-MW Lunzua HPP which will end part one of a three-phase, US\$650 million construction and rehabilitation program to provide electricity to the province's increasing population. The Lunzua power project is one of several hydroelectric projects that ZESCO has contracted LPA to complete, according to several published reports. Of the contracted projects, the total installed capacity will be 247 MW, with an expected 2017 completion date, according to ZESCO.³⁹ The largest of these plants will be the 219 MW Kalungwishi HPP.⁴⁰
- The Northwestern Energy Corporation (NVEC) is licensed to engage in distribution and supply of electricity. It has a BSA with ZESCO to supply power to the Lumwana Mining Corporation's housing complex (8.6 GW purchased in 2010).⁴¹

Potential IPP Opportunities

- CEC intends to develop a 15 MW Solar Project to be called "Riverside Solar Park" in Kitwe at a budgeted cost of about US\$35million. The project was expected to be the first grid connected utility scale solar project in Zambia. Commissioning of the 15 MW solar plant was envisaged to be in the last quarter of 2015. CEC also has plans for a 1 MW biomass project and a 40 MW HPP on the Laupula River. Both projects have undergone pre-feasibility studies, but have not undergone any construction.⁴²
- CEC and TATA Africa Holdings have entered a consortium and received the rights to conduct a feasibility study for the development of the Kobompo Gorge HPP (34 MW) to feed power into the ZESCO grid. The company has submitted a number of assessments to the government, but has yet to close on an implementation agreement or PPA.⁴³
- TATA Africa Holdings has also created a joint venture directly with ZESCO to develop the Itehi Tehzi HPP on the Kafue River (120 MW). The joint venture entered into a PPA with ZESCO to supply the utility's grid in 2010. Construction has begun on the plant.⁴⁴
- The Ndola Energy Company, owned by Great Lakes Energy and the Zambian Citizens Economic Empowerment Commission, intends to develop an HFO-fired power plant adjacent to the Indeni Petroleum Refinery, which it operates. The company entered into a PPA to develop this project in 2011.⁴⁵
- The Zengamina Power Company is an off-grid power generation and supply corporation with .75 MW of installed capacity. The company has been operating small diesel and HFO generators since 2009.⁴⁶
- There are also a number of opportunities for large HPPs on the Zambezi River, which is under the jurisdiction of the Zambezi River Authority (ZRA), an inter-governmental organization owned and operated jointly by the governments of Zambia and

³⁸ Aguai Mara Website, <http://www.aguaimara.com/projects/zambia-lunsemfwa-and-mulungishi>

³⁹ <http://www.lusakatimes.com/2011/08/23/govt-signs-650-million-power-project-deal/>

⁴⁰ http://www.sinomach.com.cn/templates/T_news_en/content.aspx?nodeid=252&page=ContentPage&contentid=2892

⁴¹ IISD Report, http://www.iisd.org/tkn/pdf/investment_incentives_zambia.pdf

⁴² ERB Energy Sector Report 2013, <http://www.erb.org.zm/reports/EnergySectorReport2012-2013.pdf>

⁴³ ERB Filing

⁴⁴ ERB Filing

⁴⁵ ERB Filing

⁴⁶ IISD Report, http://www.iisd.org/tkn/pdf/investment_incentives_zambia.pdf

Zimbabwe. These opportunities include the Batoka HPP (1,600 MW), which has undergone pre-feasibility and feasibility studies, and a number of unstudied projects including the Devil's Gorge HPP (500 MW), and the Mpata Gorge HPP (543).⁴⁷

Interconnection with South Africa

The Zambian electricity industry has three entities that participate in the Southern African Power Pool (SAPP). ZESCO is an operating member of the power pool while CEC has the status of an Independent Transmission Company (ITC) and the LHPC has the status of an IPP.

As a major hydroelectric based system, the integration and participation of the Zambian power industry provides some diversification of supply in the region. Historically, the SAPP region has been demarcated as having a largely thermal southern network and a largely hydro northern network.

Interactions with the Power Pool

CEC has a control center on the Copperbelt where they operate and maintain a network comprising transmission, distribution and generation assets. The assets comprise an 80 MW emergency power plant, as well as transmission and distribution lines of approximately 1,000 km, 41 high voltage substations and electricity networks with carrying capacities in excess of 700 MW. CEC also operates an interconnector with the Democratic Republic of Congo, through which power is wheeled to Zambia, Zimbabwe and South Africa. A subsidiary of CEC, CEC Africa has interests in the power sector across Africa including equity interests in the planned Kudu Power Project in Namibia.

Cross Border Transmission Lines

Zambia has six interconnectors that transmit and wheel power. The table below shows the existing Zambian interconnectors.

Table 4: TRANSMISSION SYSTEM LINE LENGTHS

	ZESCO			Copperbelt Energy Corp.			Lunsemfwa Hydro Power Co.		
	km	No.	MVA	km	No.	MVA	km	No.	MVA
66kV	3589.4	38	42	590	35	43	164	3	43
88kV	788	15	56						
132kV	201.6	5	112						
220kV	579	5	230	228.7	8	230			
330kV	2310	21	700						

Note*: the MVA is for each line.

Table 5: CROSS BORDER LINE CAPACITIES

	CONGO DR			ZIMBABWE			Botswana, Tanzania & Namibia		
	km	No.	MVA	km	No.	MVA	km	No.	MVA
66kV							3 + 21	2	43
220kV	17	1	230				8	1	230
330kV				1.5	2	700			

Note*:

66kV line to Kasane in Botswana is 3km up to the border.

66kV line to Sumbawanga in Tanzania is 21km to the border.

220kV line to Zambezi in Namibia 8km up to the border.

Figure 2: Zambia's Transmission System⁴⁸

⁴⁷ ZRA website, <http://www.zaraho.org.zm/hydro-electric-schemes>

One of the more recently completed regional interconnectors is the Caprivi Interconnector. The project consisted of the construction of a 300 MW (upgradeable to 600 MW) high voltage direct transmission connection from the Zambian to the Namibian electricity network, interconnecting the northern and western parts of the SAPP network. The purpose of the project was to reinforce the electricity transmission interconnection between Zambia, Namibia, and South Africa. The interconnector also provided a reliable route for electricity imports and exports and has also supported the regional power market.

Additionally, several interconnections are being planned to further link Zambia with its neighbors. Discussions for a Zambia-Tanzania-Kenya (ZTK) power interconnection are ongoing, with a memorandum of understanding signed in December 2014. The project would link SAPP with East Africa and reinforce the national grid in Tanzania (and thereby potentially make Tanzania an operating member of SAPP). The interconnector is expected to be bi-directional, have a voltage of 400 MW and thermal limit of 400 MW.

Perhaps the highest profile transmission project is the ZIZABONA interconnect. The project will allow four countries (Zimbabwe, Zambia, Botswana, and Namibia) to export and import more power and trade energy with each other and with the wider SAPP area. Additionally, the line will ease congestion between Zimbabwe and South Africa and increase reliability. The project is expected to total approximately 408 km of 400 kV infrastructure.

REVIEW OF IPP GOVERNANCE

IPP Procurement Programs

Zambia's PPP Act grants significant powers to the contracting authority to authorize award of IPP contracts without competitive procedures when approved by the PPP Unit (presumably the OPPPI). These include recognition of urgent need, inclusion of trade secrets, or when no other proposal complies with the guidelines. In the case of unsolicited proposals, which must be announced and competed publically within 14 days of receipt, there may be opportunities for bidders to influence solicitations, shield private knowledge, or craft the procurement landscape in a way that limits competition. Further limits to competition include the PPP Act's disclosure policies, which keeps confidential all negotiations, even finalized project documents. Best practices from the Extractive Industry Transparency Initiative include disclosing project agreements as a means of enhanced public accountability for power projects.

From a planning perspective, the most recently published National Energy Strategy from 2008 includes no resource planning and no designated IPP program. There are no published standardized PPAs that we have been able to locate.

Legal & Institutional Environment for Private Sector Investment

The legal and institutional environment for private sector investment includes all of the actors described earlier in the report. The most notable for the facilitation of private sector investment in energy are the OPPPI within the MEWD, the ZDA, and the REA. Each of these entities has been granted authority to provide a variety of incentives to investors interested in building and/or operating power projects in Zambia.

The IPPs currently in Zambia's pipeline were received by the MEWD as unsolicited bids which were then advertised for competitiveness, in line with the PPP Act of 2009. The GRZ uses the OPPPI to negotiate the sharing of risk and reward between investors and the government when creating IPP project documents. In particular, many implementation agreements for HPPs have drought and geological risk mitigation between the government and

⁴⁸ ERB Sector Report

<http://www.erb.org.zm/downloads/eregulation/zescotariffs/DescriptionoftheZambiaElectricitySystem.pdf>

investors. For HPPs, the OPPPI also manages a framework package of incentives (FPI) for developers including a range of investment facilitation and tax incentives for developers. The OPPPI further supports the private developers directly in acquisition of electricity licenses, land and water rights, and environmental impact assessments.⁴⁹

The REA established a rural electrification fund drawn from a levy on all units of electricity sold across all customer categories. This fund is used for the development of rural electrification projects, including transmission and generation assets. The REA also provides capital support to small scale and mini-grids using renewable energy sources.

Appropriation of publically-tendered projects has been a problem in Zambia recently. In 2012, the GRZ reversed the privatization of Zamtel, the nation's telecom network, from Libya's LAP GreenN. The GRZ cited corruption and flawed procurement as the reason for re-appropriation. Later in the year, the GRZ terminated an agreement with the privately-owned Zambia Border Crossing Company to manage five border posts. The GRZ cited smuggling and revenue loss as grounds for re-appropriating the posts, which were procured as a design, build, and operate PPP. Neither private party has received full compensation from the GRZ. The same year, the GRZ terminated the concession of the Railway Systems of Zambia, the country's largest railway operator, and returned the property to the State-owned Enterprise Zambia Railway.⁵⁰ These actions, in combination with unclear institutional framework for procuring IPPs, demonstrate deep instability within the enabling environment for private capital.

Strengths

Zambia's strengths lie in its geographic features. There appear to be abundant opportunities for low-marginal-cost HPPs throughout Zambia. The mining industry drives a stable, predictable baseline consumption with long-term anchor customers in economically-important zones. Being centrally-located in Southern Africa affords Zambia increased adaptability in its power supply, giving it the ability to import during shortfalls or export during surplus.

The incorporation of the grid code into the power sector is also a significant showing of interest in a more competitive and efficient power generation market.

Improvement Areas

In spite of its advantageous natural resources and geography, Zambia suffers a clear lack of progress in expanding generation capacity through IPPs. Despite ratings favorable to its peers in the World Bank Doing Business rankings, its investment climate still faces major hurdles. The GRZ, led by MWEF will need to improve its credibility by designing and implementing a clear framework for procuring and executing IPPs. Meanwhile, ZESCO and the ERB will need to work together to further wrest themselves from political control in order to make the hard choices associated with building up a tariff regime based on the cost of serving and expanding the customer base. Considerations for improvement areas are many, but may include, for example:

- Designing and implementing a well-articulated and realistic IPP framework
- Enabling further private ownership of transmission lines
- Updating the OPPPI website to serve as a central repository for all IPP project documents and news on IPPs
- Implementing mechanisms to allow IPPs to more effectively hedge risk
- Creating annual, audited financial statements for ZESCO

⁴⁹ The IISD "Investment Incentives for Renewable Energy in Southern Africa: Case Study Zambia" presents an in-depth look at all financing mechanisms and incentives offered by the GRZ for IPP developers. http://www.iisd.org/tkn/pdf/investment_incentives_zambia.pdf

⁵⁰ Department of State Report, <http://www.state.gov/documents/organization/229323.pdf>

- Ensure that HPP developments are coordinated so that one project's placement does not diminish the feasibility of another
- Equip ZESCO with the data collection abilities necessary to effectively demonstrate its cost of service and apply for cost-reflective tariffs

DONOR IPP / GENERATION INITIATIVES

World Bank

The World Bank (WB) has been the lead on the Zambia Power Rehabilitation Process (PRP), which is expected to fill in the electricity supply demand gap and include rehabilitation of existing power stations, upgrade transmission and distribution lines, as well as demand side management measures with a budget of more than US\$320 million supported by the World Bank, European Investment Bank (EIB) and ZESCO⁵¹. Starting in 2008, the WB has also provided investment loans through the Zambia Increase Access to Electricity services, totaling US\$93 million since inception. The objective of this project is to increase service provision, energy efficiency, and distribution system quality. The project began working with ZESCO on operationalizing energy efficiency and demand-side management, access expansion, and rural electrification.⁵² This program was expanded in 2011 to include grid intensification, expand mini-hydro development, and provide small-scale solar arrangements to communities. The program has also worked with ZESCO to improve loss reduction by improving transmission lines and establishing a connection fee subsidy scheme for low-income households.⁵³

African Development Bank (AfDB)

The AfDB maintains a strategy of engaging Zambia in order to “support economic diversification through infrastructure development” targeting projects that enhance intra and international connectivity.⁵⁴ Recently, the AfDB financed the construction of The Katima Mulilo Power Interconnection a 220 kV transmission line between Namibia and Zambia. The bank is currently supporting the ZIZABONA Regional Interconnector, a 400/330 kV transmission line between Zimbabwe, Zambia, Botswana and Namibia. The bank is also lending to generation projects, including the Itezhi Tezhi HPP and transmission line and the Kariba HPP rehabilitation project.^{55 56}

JICA

JICA has projects related to capacity development to the REA for rural electrification. It also implemented the Increased Access to Electricity Services project, which ended in 2013,

⁵¹ IRENA Website, http://www.irena.org/documentdownloads/publications/rra_zambia.pdf

⁵² World Bank Project Brief, <http://www.worldbank.org/projects/P077452/zm-increased-access-electricity?lang=en>

⁵³ World Bank Project Brief, <http://www.worldbank.org/projects/P121325/additional-financing-zambia-increased-access-electricity-services-project?lang=en>

⁵⁴ AfDB Zambia Country Engagement Strategy, <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/ZAMBIA%20-CSP%202011-2015.pdf>

⁵⁵ AfDB Project Document, <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Zambia - AR - Itezhi-Tezhi Hydro Power and Transmission Line Project - Rev 1 .pdf>

⁵⁶ AfDB Project Document, <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/MULTINATIONAL - Appraisal report - Kariba Dam Rehabilitation Project - ONEC %E2%80%93 Approved %E2%80%93 12 2014.pdf>

focused on extending existing grid networks and establishment of minigrids in multiple Zambian provinces.⁵⁷

Department of State

The Department of State has provided assistance to support the Regional Electricity Regulators Association (RERA) in the development of an IPP framework model to encourage the private sector to invest in the power sectors of SADC-member countries. Deloitte presented a strategy to address identified barriers and successfully realize the identified investments, provided recommendations for the appropriate IPP market framework, recommended the policy roles, functions, responsibilities, and procedures of key government organizations with respect to the private power sector based on the policy and Electricity Acts of the respective SADC countries, and developed preliminary formats, guidelines, record keeping instruments, and process blueprints for the review and licensing of IPPs. It will also be supporting RERA in its efforts to promote cost reflective tariffs throughout the Southern Africa Region, in order to attract investment and encourage energy efficiency. These efforts will be advanced through assistance in preparing an updated, accurate, and comprehensive publication on tariff data across member countries for the current year. Additionally, a workshop will be conducted with all data contributing countries in order to reach consensus on relevant data, provide advice on movement toward cost reflective tariffs, and bring together SMEs on topics of relevance.

USAID

The USAID Southern Africa Trade Hub (the Trade Hub) was established to increase international competitiveness, intra-regional trade, and food security in Southern Africa. Under this scope, the activities of interest to this report are their efforts in support of renewable energy generation in the region. In coordination with the Department of Energy (DOE) under the Ministry of Mines: Energy and Water Development (MMEWD), the Trade Hub is supporting the development of a Renewable Energy Feed-In-Tariff (REFIT) policy as well as driving capacity building for the REA and the ERB. The development of a REFIT Policy for Zambia will create the tariff guidance to various stakeholders and IPPs as they develop the renewable energy sector in the country. With regards to the Trade Hub's work with REA, the Hub has worked to remove capacity limitations in project management and contracting, monitoring and supervision of rural electrification projects. The activity will enhance implementation of the Rural Electrification Master Plan (REMP) and penetration of clean energy technologies in rural areas of Zambia. Work with ERB involves development of an avoided cost tariff for Zambia in the interim period when the REFIT policy is being developed and building ERB capacity to design REFITs for selected technologies.

Other Development Agencies in Peripheral Sectors

Zambia is an MCC compact country. However, the compact does not have an explicit electricity program. Rather, the program targets "water supply, sanitation and drainage infrastructure with the goal of decreasing the incidence and prevalence of water-related disease, productive days lost due to disease and time to collect water, cost of water and new sanitation, and business and residential flood losses."⁵⁸ USAID currently has a small energy portfolio in Zambia working to pilot a national greenhouse gas emissions and deforestation reduction strategy.⁵⁹ The UNDP has a presence in the Zambian energy sector, but concentrates on LEDS, specifically related to prevention of deforestation and tracking GHG emissions. GiZ is involved with water resource planning and management.

⁵⁷ JICA Website, <http://www.jica.go.jp/zambia/english/activities/>

⁵⁸ MCC Zambia Website, <https://www.mcc.gov/pages/countries/program/zambia-compact>

⁵⁹ USAID Zambia Website, <http://www.usaid.gov/zambia/environment>

ANNEX A: AREAS OF INTEREST FOR SCOPING TRIP

1. ZESCO has not released a financial or operational report in some years, and there is a need to confirm:
 - a. Distribution network structure and assets
 - b. Financial performance/status
 - c. Loss figures and explanation
2. OPPPI Documentation:
 - a. Statement of strategic vision or basic functions
 - b. Guidelines for navigating the various stages of the procurement process
3. National Energy Policy (2008) and relevant electricity legislation:
 - a. Mechanisms for facilitating renewable energy IPPs
 - b. Capacity for fostering RE IPPs