OPPORTUNITIES FOR RENEWABLE ENERGY IN ZAMBIA

March 2019

SOCIAL ECONOMIC STATUS- ZAMBIA

ITEM	
Population	16,000,000
Installed Generation Capacity	2500MW
Main Economic Activity	Copper Mining/ Agriculture
GDP Growth per year	(6-8)%
Currency	ZMK (12-1)US$
Main Economic Driver	Mining (77%)

Introduction

Current power generation status

- Zambia's installed capacity is about 2,797 MW.
- Energy demand growth at approximately 6 % per year
- National electrical access rates at about 31%
- Electricity supply is predominantly based on hydropower at about 83% of the total installed capacity
- Dependence on hydropower makes Zambia vulnerable to climate change;

Zambia's Generation status

Potential Generation Sources

- Zambia's hydropower resource at over 6,000 MW
- Significant solar potential of 600-1000MW (without grid upgrade)
- Relatively abundant Coal resources
- Other renewable sources – biomass, wind, geothermal

Zambia's Solar Irradiation Map

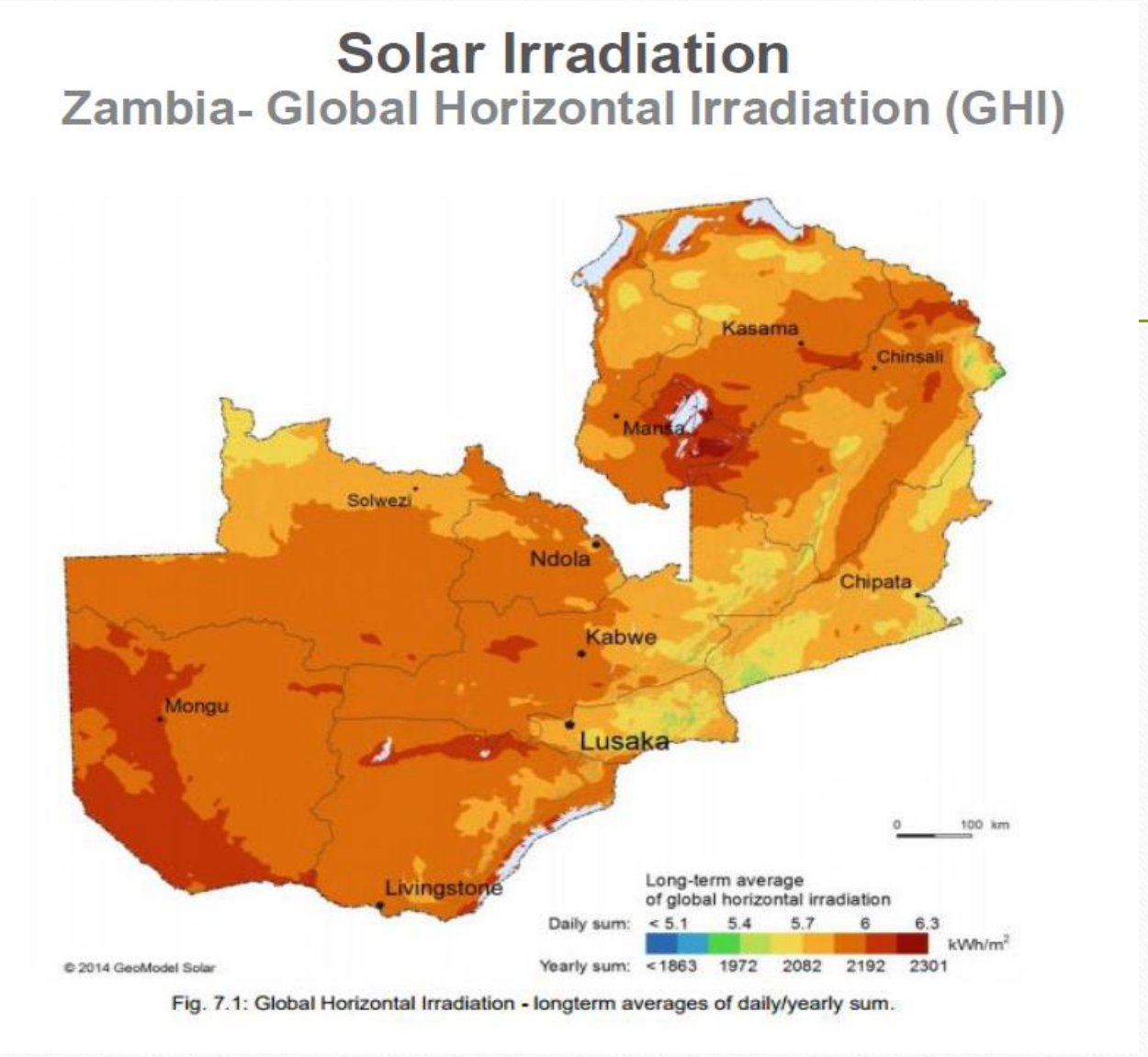
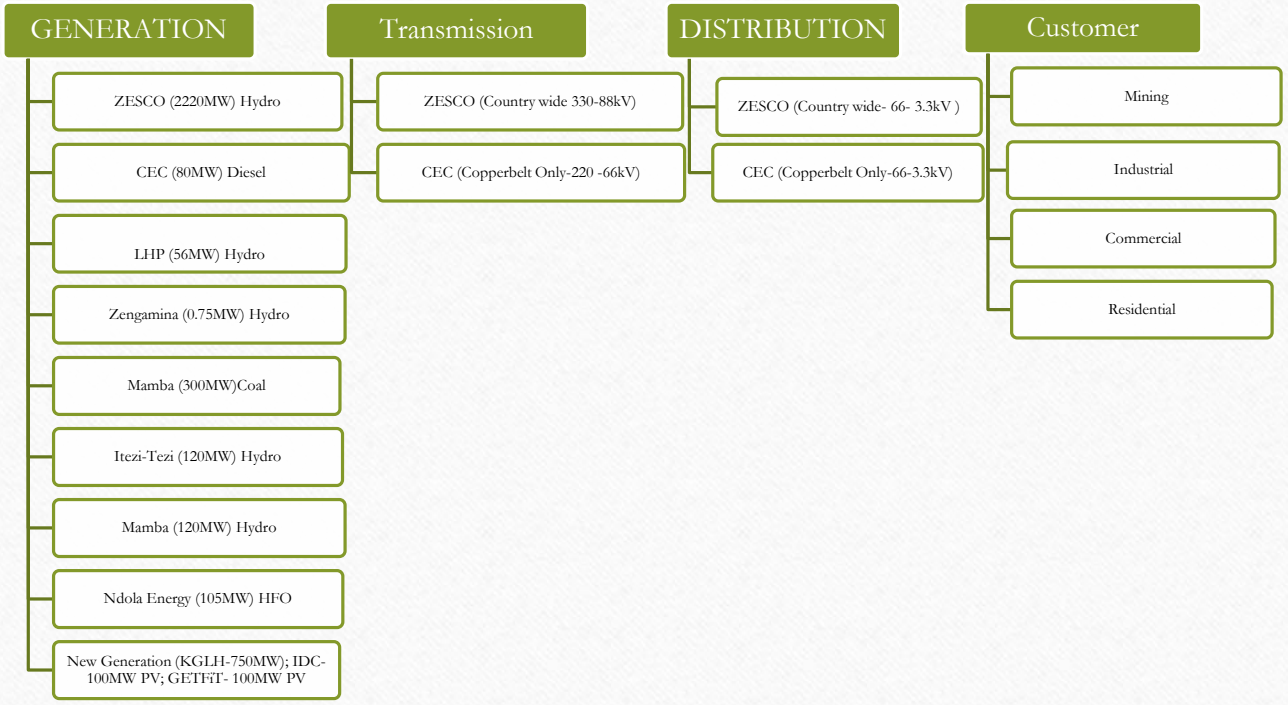


Fig. 7.1: Global Horizontal Irradiation - longterm averages of daily/yearly sum.

Zambian Energy Industry



Zambia's Current Renewable Energy Plans

REFIT

- 200MW GETFiT (100 Solar, 100 Small hydro)
- KfW sponsored
- Round 1 Award due 12 April

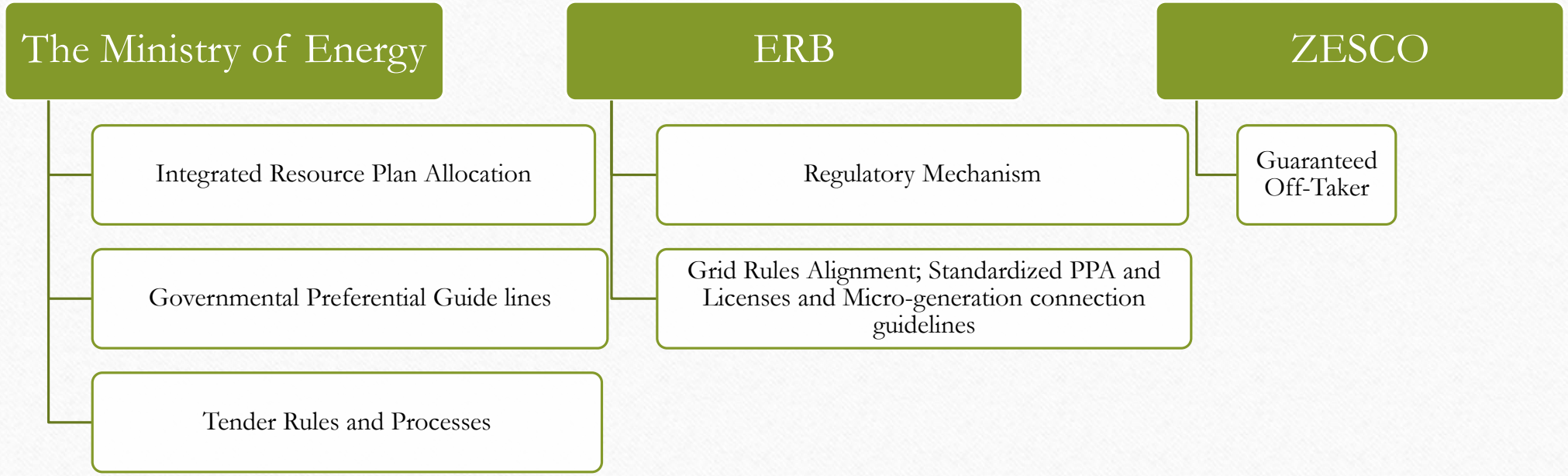
Scaling Solar Program

- IDC/IFC Program
- Target 600MW Solar PV
- Round 1 – 100MW, COD Q1 2019
- Round 2 – 250MW

Other Programs

- Microgrids systems – REA
- IPPs with ZESCO

Zambian's Current Renewable Energy -Roles



Renewable Energy Deployment Challenges

Requires **increased operating reserve** to balance the system and **manage system frequency**

Increases the overall cost of operating the power system (balancing power and reserves)

Connection of large variable RE plants has the potential causing **of instability** on the network and for adversely affecting **power quality**

Solar technology is not the best where there is need to curb peak demand since maximum production is during the day and their is no production during night and early morning peak periods

Increased RE generation can lead to increased stress on system operation in instances due to

insufficient reserves associated with RE resource availability **forecast errors**

Key Regulatory Initiatives(1)

Standardized PPA Review Methodology

- Intended to reduce regulatory burden associated with procuring a PPA

Renewable Energy Regulatory Framework

- to provide clear and transparent regulatory rules and requirements to promote investment in the renewable energy and energy efficiency sectors

Development and Implementing of the Transmission & Distribution Grid Codes

- Provides clear technical rules for non-discriminatory access to transmission/ distribution networks
- Grid Codes being revised to provide technical requirements for connecting variable renewables
- Aspects of **net metering** also covered

Key Regulatory Initiatives(2)

Investment Endorsement Framework for Power Projects	• Provides comfort to investors in lieu of a license prior to project implementation
Development and revision of various technical standards	• Various solar/ renewables standards developed/ under development to provide technical requirements for various technologies
Development of Draft Open Access Regulations	• Meant to complement the Grid Codes by providing rules for open access (dispatch rules, congestion management, disputes resolution, transmission pricing methodology, system operation
Second Cost of Service Study planned for 2019	• Key deliverables being least cost generation plans covering all generation types, cost reflective tariff levels, transmission pricing
Combined License for Off Grid Systems	• Streamlining licensing requirements for off-grid systems where renewable energy systems have been seen as easiest to deploy

Utility Tariff Overview

There are two consumer categories in the Electricity Sector:-Non Mining retail category, whose tariffs are set by the ERB and the Mining sector, where tariffs are governed by the long term PPAs. For the latter, the tariffs are usually locked in US$ with an annual escalation of about 2%

- TOU Tariff is applicable to Commercial and Industrial Customers (Max. Dem. Customer tariff category)
- Mine Customers usually sign PPAs with the Power Utility
- Residential Customers enjoy a uniform tariff

Three Tier Tariff Regime

Under 3-Tier tariff Regime, the tariff structure is as follows:-

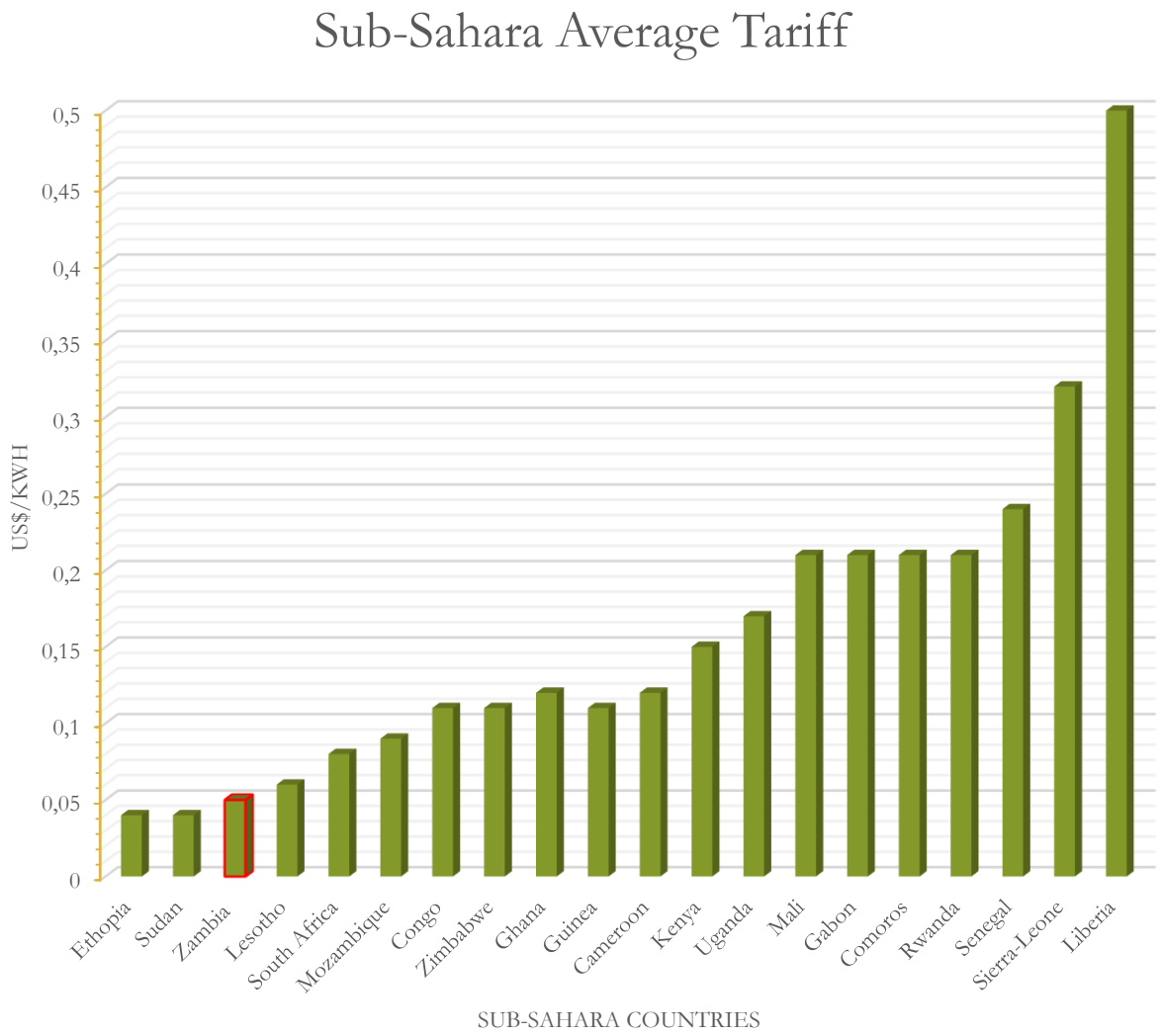
- Standard – 06:00hrs to 18:00hrs
- Peak - 18:00hrs to 22:00hrs
- Off Peak- 22:00hrs to 06:00hrs
- Under a 3-tier regime, customers are billed on three readings component namely, standard, peak and off peak for both energy and demand (weighted average).

It was envisaged that customers would avoid operating during peak to avoid a higher tariff

Sample TOU Tariff

Bill Items	Consump kWh/kVA	Rate US$/kWh		Charge(US$)
Energy Std	122,243.00	0.025		3,056.08
Energy Peak	42,366.00	0.031		1,306.29
Energy Off Peak	83,822.00	0.019		1,606.59
Demand Std	605.00	3.811	0.34	776.65
Demand Peak	586.00	4.764	0.33	910.91
Demand off Peak	605.00	1.906	0.34	388.41
Fixed Charge	1.00	3990.333		3,990.33
Exercise Duty		3%		361.06
VAT		16%		1,983.41
Total				**14,379.72**

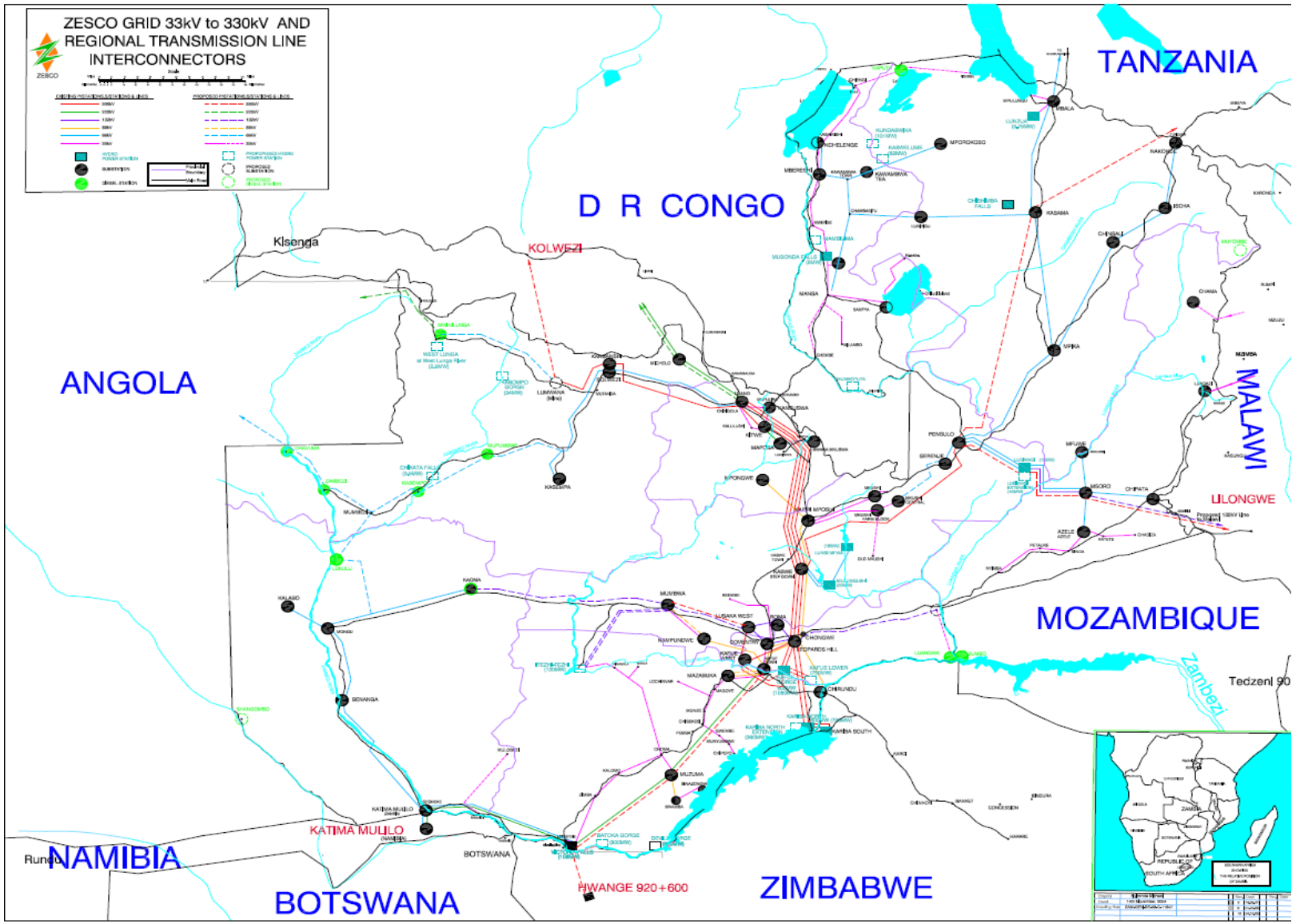
1.Electricity Tariffs in Zambia remain among the lowest in the region
2. Tariffs and revenue are generally below cost recovery for domestic consumers
3. Currently tariff cost study is underway to correct the situation

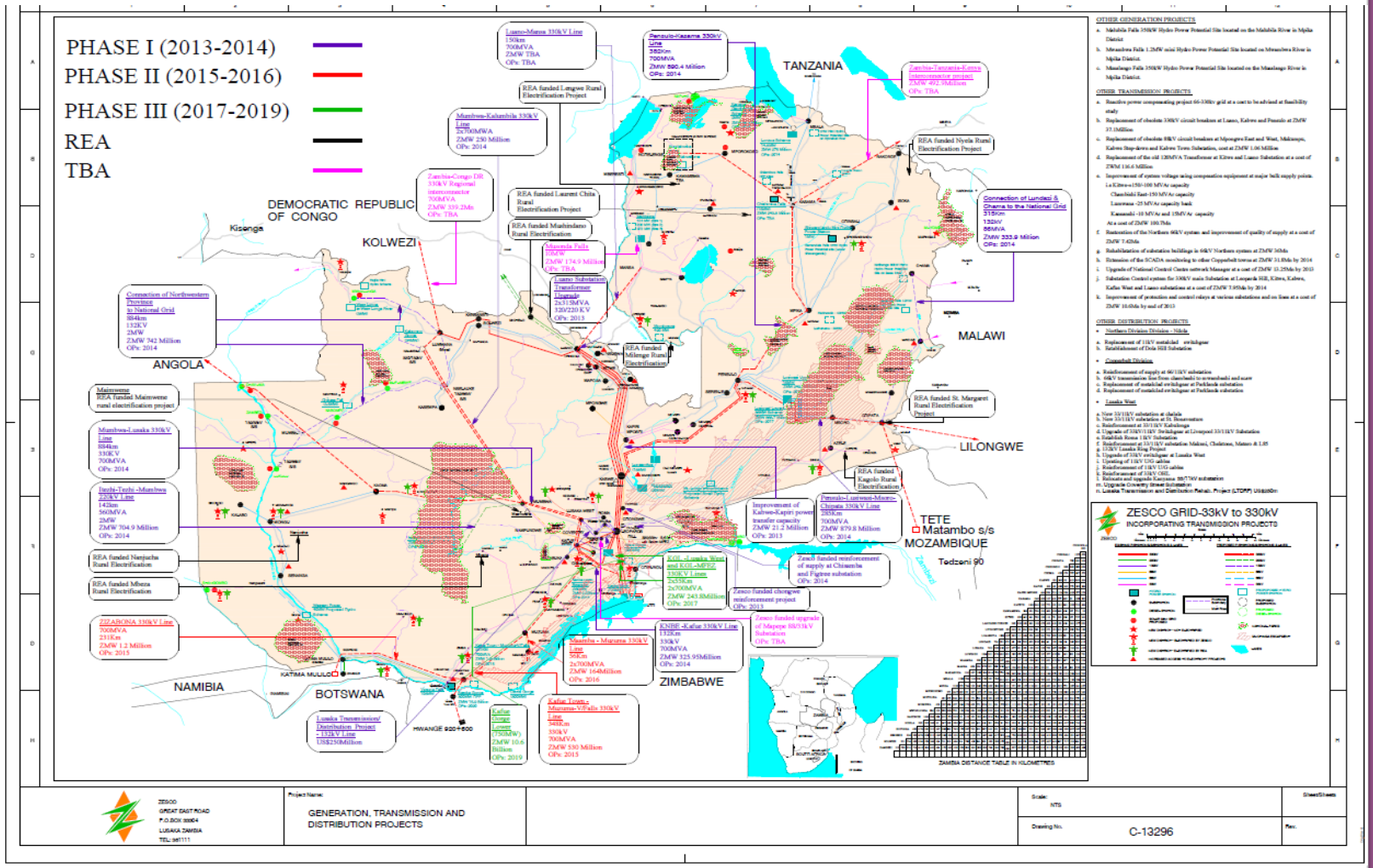


Solar PV Tariff Period

- Solar PV is largely generated during standard tariff periods and does not benefit from peak tariff.
- ZESCO tariff is based on TOU for maximum Demand Customers
- Higher energy tariffs are incurred during peak national usage which normally occur outside solar generation periods
- The higher tariff periods do not coincide reasonably well with solar PV generation periods

ZAMBIAN GRID.





ZESCO GRID (33-330kV) incorporating Projects

SUMMARY

Over dependency on hydro power - very risky

- Alternatives available energy (including renewables) can reduce the risk
- Zambia's renewable energy market is in a "consolidation process", and the Government is open to discussing unique challenges
- Very competitive market, projects need to be optimized from all angles (financial, technical, etc.)
- The role of the regulator is to create an enabling regulatory framework that support investment in renewable energy
- Continuous improvement and benchmarking on regulatory regime to be responsive to changing needs of the industry
- Sub-renewable energy tariff
- Urban/Rural electrification 31% to 4%