RERA Publication on Electricity Tariffs & Selected Performance Indicators for the SADC Region

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RERA Publication on Electricity Tariffs & Selected Performance Indicators for the SADC Region

2014

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Foreword

Energy is vital to development in Southern Africa, as fuel and electricity catalyze infrastructure projects that drive Regional Integration and sustainable economic growth. As the Southern African Development Community (SADC) region industrializes on its path to improved human development, energy production and distribution will only increase in importance. SADC has enacted several strategic plans for energy development in the region, most recently the Regional Infrastructure Development Master Plan and its Energy Sector Plan in 2012. These strategies set out tangible objectives for SADC and its Member States for infrastructure development in energy and its subsectors of wood fuel, petroleum and natural gas, electricity, renewable energy, and energy efficiency and conservation.

The SADC region has made significant strides, particularly in electricity. At present, nine Member States of SADC have merged their electricity grids into the Southern African Power Pool, reducing costs and creating a competitive common market for electricity in the region. At its meeting in South Africa in 2015, the SADC Council of Ministers resolved that Member States should endeavor to reach cost reflective electricity tariffs within a period of 5 years, i.e. by 2021. Incrementally, regulators and policy makers have continued to make progress each year on reducing external subsidies in tariff methodologies and incorporating consistent, cost-reflective approaches to determining and setting tariff rates in their countries.

Since its establishment by SADC, the Regional Electricity Regulatory Association (RERA) has been an essential source of support for the region's policy makers and regulators for analyzing and reviewing Southern Africa's tariff and regulatory policies on energy and its subsectors. Starting in 2009, RERA has endeavored to produce a publication on the annual developments in electricity tariffs and their cost reflectivity in Member States, and to provide a comparative analysis of such tariffs for the SADC region.

This fifth publication provides an opportunity for national electricity utilities, energy/electricity regulators and their respective governments to address some of the challenges regarding the availability of timely, reliable and comprehensive information from within the electricity supply industry (ESI). With more SADC countries establishing energy/electricity regulators that continue to increase RERA membership, the deepening comparative analysis of the tariffs and other ESI performance indicators at the regional level provides a platform for informing cross-border electricity infrastructure investment and trading decisions, and paves the way for benchmarking, monitoring and evaluation. This current publication provides information of interest to governments, ESI practitioners, regulators, utilities, non-governmental organizations, academia, private sector investors and others interested in regional trends on electricity tariffs and performance. With the continued support from its main stakeholders, RERA aims to enhance the scope, depth of analysis and timeliness of future publications.

RERA would like to thank SADC Member States, the SADC Secretariat and the SAPP for their good cooperation in providing the information used in the publication. RERA is also grateful to the U.S. Department of State's Bureau of Energy and Resources for supporting the development of this publication.

Special thanks go to the Energy Regulation Board of Zambia, the RERA Economic Regulation Subcommittee and Deloitte Financial Advisory Services LLP for the collection, analysis, and compilation of this Publication.

Lastly, we remain saddened by the untimely passing of our dear friend and colleague, Dr. Lawrence Musaba, earlier this year. As SAPP Chairman, Dr. Musaba was a tireless supporter of reform and productive investment in Southern Africa to improve the economic development of the region and the lives of its citizenry. He will be deeply missed, and we are grateful for his many contributions to our collective goals.

Paseka Nku
Acting RERA Chairperson and Acting Chief Executive Officer (CEO) of the National Energy Regulator of South Africa (NERSA)

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1.	Pinehas Mutota	ECB (Chairperson)
2.	Sabelo Dube	SERA (Secretary)
3.	Cláudia Guibunda (Ms.)	CNELEC
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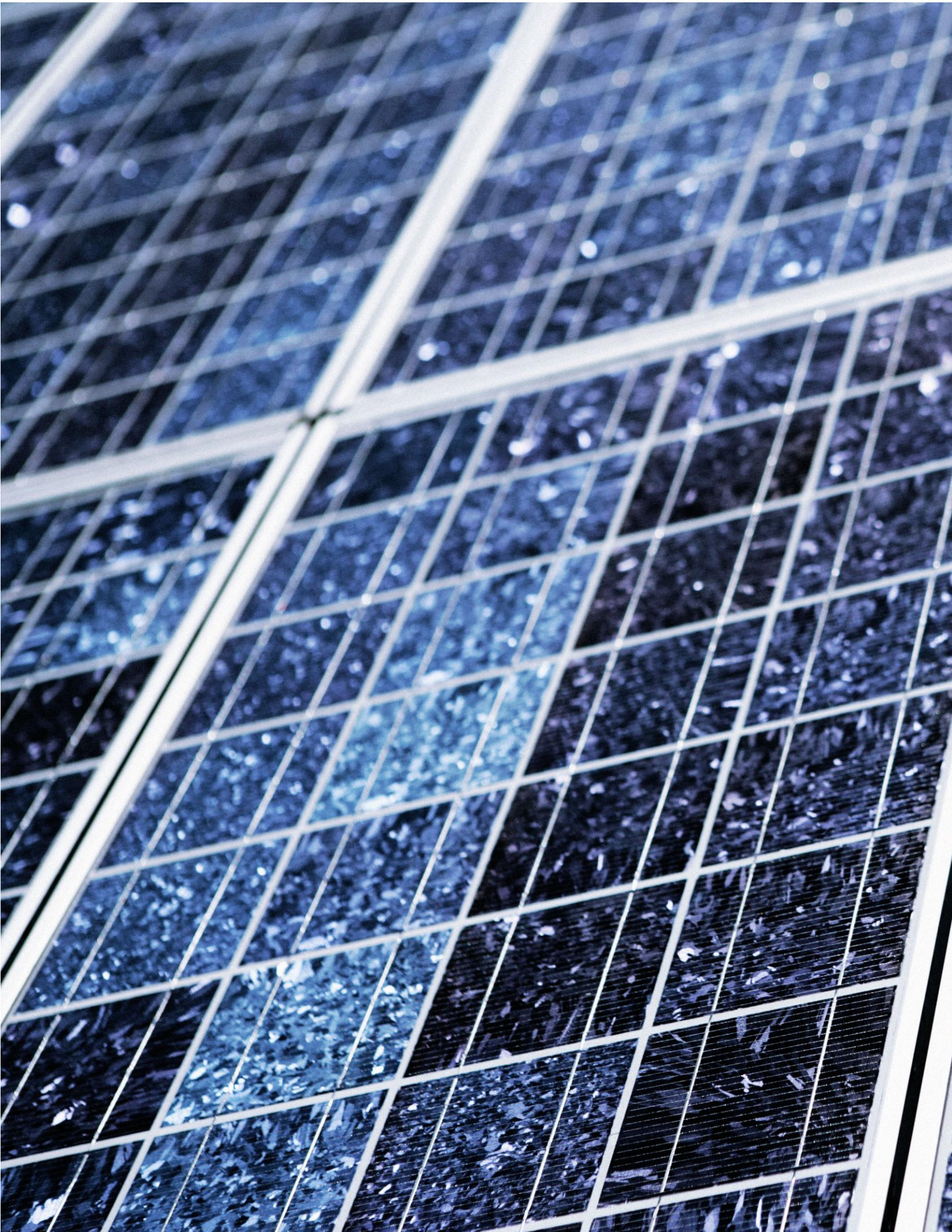
The support of stakeholders in the region is also gratefully acknowledged, especially the SADC Secretariat and the Southern African Power Pool (SAPP).

For further information or for provision of feedback, please contact the RERA Secretariat via email: secretariat@rerasadc.com

This publication is also available to download for free from the RERA website: www.rerasadc.com



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Glossary

In compiling a technical document such as the 2014 Tariff Report, it is important to strive for a common interpretation of terms, definitions, and usage to give readers a shared understanding of the issues under discussion. While the Glossary & Abbreviations below were developed to support the 2014 Tariff Report, it is, however, important to point out that a term's inclusion in the list does not necessarily indicate that there is full agreement on its definition amongst all Member States at the time that respondents provided data. As such, there may be inconsistencies in the way countries have used certain terms, possibly impacting comparability between some metrics. Also, some of the terms listed may not necessarily feature in this 2014 Tariff Report, but they were deemed to be additive to the context and understanding of the subject matter as a whole.

The following descriptions are based on definitions used by the U.S. Energy Information Administration (EIA), the U.S. Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Council (NERC), and within EU Directives and the ENTSO-E Statistical Glossary.

Term	Description
Allowable costs	Total costs approved by the regulatory authority to be included in the calculation of tariff rates.
Ancillary services	Services that ensure reliability and support the transmission of electricity from generation sites to customer loads. Such services may include load regulation, spinning reserve, non-spinning reserve, replacement reserve, and voltage support.
Available generator capacity	Net capacity of the generator available for selling through the network. It differs from the installed generator capacity (nameplate generator capacity) and is expressed in megawatts (MW).
Capacity charge	An element in a two-part pricing method used in capacity transactions (energy charge is the other element). The capacity charge, sometimes called Demand Charge, is assessed on the amount of capacity being purchased rather than the amount of energy used. Cost-reflective tariffs seek to capture the marginal cost, which is the cost of the very last unit of energy produced. Short run marginal costs tend to be low in the electricity sector because capacity cannot be expanded quickly, but long run marginal costs become variable and higher as capacity is added or removed to adjust to changing demand patterns.
Capital costs	Costs for the acquisition of the utility plant.
Commercial sector	An energy-consuming sector that consists of service-providing facilities and businesses and includes institutional living quarters and sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, and lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.
Commercial losses	Also called non-technical losses, this includes all energy lost due to energy theft, errors in metering, billing, and data processing as well as differences between real consumption and the estimated consumption of customers within a specified time period.
Cost-plus methodology	A tariff determination methodology in which the final price that customers pay is the sum of the actual costs per unit and an agreed profit margin, typically on a percentage basis. Under this methodology, a utility is required to submit a tariff application to the regulator for award of a tariff along with supporting documents for justifiable costs.

Term	Description
Cost-reflective tariffs	These are tariffs that reflect the true cost of supplying electricity and remove any reliance on external subsidies or budget allocations to cover the variance between current tariffs and the true cost of electricity supply. Costs are allocated in entirety to those customer classes who consume electricity services when they are incurred. Factors impacting true cost include location, time and pattern of use, existing network connections, and impact of other users. Inputs that make up the cost of supplying electricity include: 1) a fixed charge, reflecting the capacity investment required to operate the electricity system, and 2) variable charges, which are directly impacted by changes in input costs and customer behaviors.
Cost of service regulation	A traditional electric utility regulation under which a utility is allowed to set rates based on the cost of providing service to customers and the right to earn a limited profit.
Cross-subsidy	The allocating of revenue requirement among classes of customers so that one class pays less than its cost of service and other classes make up the revenue shortage.
Demand (electric)	The rate at which electric energy is delivered at an instant or on average over a certain period. Usually expressed in kW or kVA.
Demand metered	Customer billing based on measured usage levels in kWh over a specified period of time.
Distribution	Refers to the process of transporting energy from transmission systems to end-use customers. In some contexts, distribution is considered to be any transmission of energy on lines carrying less than 110,000 volts.
Distribution market participant	A distribution company that is operating on MV and LV, and transporting electricity to final customers. In some cases the distribution network may contain HV electricity lines.
Electrical system energy loss	The amount of energy lost during generation, transmission, and distribution of electricity, including plant and unaccounted for use.
Emergency Power Producer (EPP)	These are a type of IPPs who are contracted to supply electricity on a short term basis. They are frequently thermal units that can be mobilized and demobilized very quickly (sometimes within weeks).
Energy intensity	A ratio of energy consumption to another metric, typically national gross domestic product in the case of a country's energy intensity. Sector-specific intensities may refer to energy consumption per household, per unit of commercial floor space, per dollar value industrial shipment, or another metric indicative of a sector.
Fixed operating costs	Costs other than those associated with capital investments that do not vary with the operation, such as maintenance and payroll.
Gas turbine	A type of internal combustion engine in which expanding gases from the combustion chamber drive the blades of a turbine.
Generation	The process of producing electric energy by transforming other forms of energy; also, the amount of electric energy produced, expressed in kilowatt hours.
High Voltage	For the purposes of this report and as it relates to the geographical region in question, this pertains to voltage levels in excess of 35 kilovolts.
Household	A family, an individual, or a group of persons occupying the same housing unit, the housing unit is the person's usual or permanent place of residence.
Hydroelectric power	The use of flowing water to produce electrical energy.
Independent Power Producer (IPP)	A corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities for the generation of electricity for use primarily by the public, and that is not an electric utility.

Term	Description
Installed generator capacity	The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer. Installed generator capacity is commonly expressed in megawatts (MW) and is usually indicated on a nameplate physically attached to the generator.
International accounting standards	Internationally accepted accounting and reporting standards that state how particular types of transactions and other events should be reflected in financial statements.
Lifeline tariffs	A tariff setting concept whereby the initial block of energy consumed is charged a lower (often subsidized rate) to reflect a basic level of consumption needed by all households. They are often a part of a progressive tariff structure where rates are increased for consumption above a certain level. These tariffs vary from one country to another (and sometimes within countries) to reflect the levels of consumption in the specific electricity market.
Load factor	The ratio of the average load to peak load during a specified time interval.
Losses (average)	The total difference in energy input and output or power input and output (due to losses) averaged over a time interval and expressed either in physical quantities or as a percentage of total input. These include technical and non-technical (commercial) losses, which are defined individually in this section.
Low Voltage	For the purposes of this report and as it relates to the geographical region in question, this pertains to voltage levels less than 1 kilovolt.
Maintenance costs	That portion of operating costs consisting of labor, materials, and other direct and indirect costs incurred for preserving the operating efficiency and/or physical condition of utility plants used for power production, transmission, and distribution of energy.
Medium Voltage	For the purposes of this report and as it relates to the geographical region in question, his pertains to voltage levels between one kilovolt and 35 kilovolts.
Non demand metered	Customer billing based on an assumed usage level over a specified period of time. Usually applies to customers with lower consumption and at secondary voltages.
Operating expenses	Expenses incurred in the normal course of business to generate, sell, and distribute energy and services to customers. Operating expenses are accounted for when they are incurred and are not capitalized or depreciated on the balance sheet.
Operational generation capacity	The average amount of generation capacity in functional condition, available for production. Operating generation capacity includes capacity under planned maintenance. The International Energy Agency defines operating capacity as "the sum of all individual plants' maximum capacities available during a period of at least 15 hours per day."
Other market participants	Public providers, wholesale agents, retailers, traders, standardized balancing group, consolidator etc.
Peak demand	The maximum electrical load during a specified period of time, measured in MW.
Power pool	An association of two or more interconnected electric systems having an agreement to coordinate operations and planning for improved reliability and efficiencies.
Rate base	The value of property upon which a utility is permitted to earn a specified rate of return as established by a regulatory authority. The rate base generally represents the value of property used by the utility in providing a service and may be calculated by any one or a combination of the following accounting methods: fair value, prudent investment, reproduction cost, or original cost. Depending on which method is used, the rate base includes cash, working capital, materials and supplies, deductions for accumulated depreciation, contributions in aid of construction, customer advances for construction, accumulated deferred income taxes, and accumulated deferred investment tax credits.

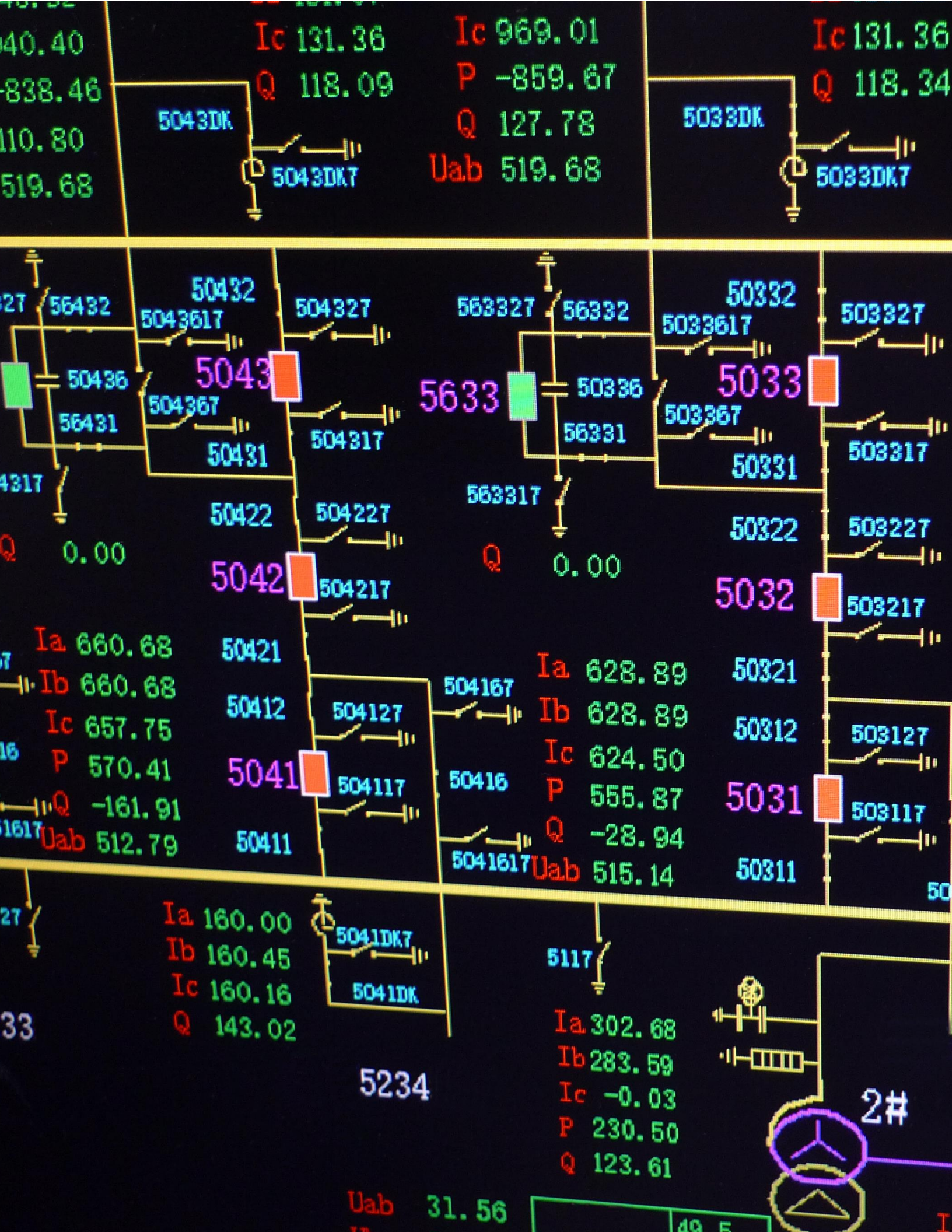
Term	Description
Rate of return methodology	A tariff determination methodology in which the final tariffs are determined by calculating the utility's total costs – including a fair rate of return on prudent capital investments – which forms the basis of a total revenue requirement.
Return on Investment (ROI)	A performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. ROI measures the amount of return on an investment relative to the investment's cost. To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment, and the result is expressed as a percentage or a ratio.
Rate of return on rate base	The ratio of net operating income earned by a utility, calculated as a percentage of its rate base.
Regulation	The governmental function of controlling or directing economic entities through the process of rulemaking and adjudication.
Reliability	The degree of performance of the elements of the electricity system that results in electricity being delivered to customers within accepted standards and in the amount desired.
Reserve margin	A measure of installed capacity over and above the capacity needed to meet normal peak demand levels.
Retail sales (electric)	Sales made directly to the customer that consumes the energy product.
Electricity Revenue	The total amount of money received by an entity from sale of its products and/or services; gains from the sales or exchanges of assets, interest, and dividends earned on investments; and other increases in the owner's equity, except those arising from capital adjustments.
Revenue requirement	The total revenue that the utility is authorized to recover, which includes fuel, operating expenses, and a reasonable return on the rate base.
Subsidy	A "subsidy" exists when there is a "financial contribution" by a government or public body that confers a "benefit". A "financial contribution" arises where: (i) a government practice involves a direct transfer of funds (e.g. grants, loans, and equity infusion), potential direct transfers of funds or liabilities (e.g. loan guarantees); (ii) government revenue that is otherwise due is foregone or not collected (e.g. fiscal incentives such as tax credits); (iii) a government provides goods or services other than general infrastructure, or purchases goods; or (iv) a government entrusts or directs a private body to carry out one or more of the above functions. A "benefit" is conferred when the "financial contribution" is provided to the recipient on terms that are more favorable than those that the recipient could have obtained from the market.
Supply	The sale, including resale, of electricity to customers.
Technical losses	These are losses on power lines and losses in transformers that are the result of the physical properties and inherent resistance of electrical conductors and components.
Time-of-use rate	A retail tariff rate structure that may be charged by an electric utility for service to various classes of customers. The rate reflects the varying costs of providing the service at different times.
Transmission	The movement or transfer of electric energy over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end when the energy is transformed for distribution to the consumer.
Transmission market participant	A company or companies involved in transmission of power and operates within the boundaries of the country.

Term	Description
Transmission system	An interconnected group of lines and associated equipment for the movement or transfer of electric energy between points of supply and points at which it is transformed for delivery to customers or is delivered to other electric systems.
Unbundling	Separating vertically integrated monopoly functions into their component parts for the purpose of separate service offerings.
Variable costs	Expenses such as fuel costs that vary based on the amount of electricity being generated by the utility.

Abbreviations

Abbreviation	Expansion
AFREC	African Energy Commission
BPC	Botswana Power Corporation
CEC	Copperbelt Energy Corporation
CNELEC	National Electricity Advisory Council of Mozambique
DBSA	Development Bank of Southern Africa
DRC	Democratic Republic of the Congo
ECB	Electricity Control Board of Namibia
EDM/HCB	Electricidade de Mozambique / Hidroeléctrica de Cahora Bassa
EIA	Energy Information Administration
ENE	Empresa Nacional de Electricidade de Angola
ENTSO-E	European Network of Transmission System Operators for Electricity
ERB	Energy Regulation Board of Zambia
ESCOM	Electricity Supply Corporation of Malawi
ESI	Electricity Supply Industry
EU	European Union
EWURA	Energy and Water Utilities Regulatory Authority of Tanzania
FERC	Federal Energy Regulatory Commission
GDP	Gross Domestic Product
HFO	Heavy Fuel Oil
IEA	International Energy Agency
IPP	Independent Power Producer
IRSE	Institute for Electricity Regulation of Angola
kVA	Kilovolt-amp
kW	Kilowatt
kWh	Kilowatt hour
LEC	Lesotho Electricity Company
LEWA	Lesotho Electricity and Water Authority
LHPC	Lunsemfwa Hydro Power Company
MERA	Malawi Energy Regulatory Authority
MVA	Megavolt –amp
MW	Megawatt

Abbreviation	Expansion
NEPAD	New Partnership for Africa's Development
NERSA	National Energy Regulator of South Africa
ORE	The Office of the Electricity Regulator of Madagascar
RERA	Regional Electricity Regulators Association of Southern Africa
RSA	Republic of South Africa
SADC	Southern African Development Community
SEC	Swaziland Electricity Company
SERA	Swaziland Energy Regulatory Authority
TANESCO	Tanzania Electricity Supply Company Limited
U.S.	United States
ZERA	Zimbabwe Energy Regulatory Authority
ZESA	Zimbabwe Electricity Supply Authority
ZESCO	ZESCO LIMITED of Zambia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1.0. Background

1.1. About RERA

The Southern African Development Community (SADC) Ministers responsible for energy policy established the Regional Electricity Regulators Association of Southern Africa (RERA) as a formal association of electricity regulators at a meeting in Maseru, Lesotho on July 12, 2002. However, RERA was officially launched in Windhoek, Namibia on September 26, 2002. The Association was established pursuant to the SADC Protocol on Energy (1996), the SADC Energy Co-operation Policy and Strategy (1996), the SADC Energy Sector Action Plan (1997), the SADC Energy Activity Plan (2000), and in pursuit of the broader initiative of the New Partnership for Africa's Development (NEPAD) and the African Energy Commission (AFREC).

RERA has the following three (3) strategic objectives:

i. *Capacity Building & Information Sharing*: Facilitate electricity regulatory capacity building among members at both a national and regional level through information sharing and skills training.
ii. *Facilitation of Electricity Supply Industry (ESI) Policy, Legislation, and Regulations*: Facilitate harmonized ESI policy, legislation, and regulations for cross-border trading, focusing on terms and conditions for access to transmission capacity and cross-border tariffs.
iii. *Regional Regulatory Cooperation*: Deliberate and make recommendations on issues that affect the economic efficiency of electricity interconnections and electricity trade among members that fall outside national jurisdiction, and to exercise such powers as may be conferred on RERA through the SADC Energy Protocol.

The Association strives to be a credible regulatory association with the following Vision Statement:

> "To be a world class association that ensures a consistent and harmonized regulatory framework in the energy sector within the SADC region."

RERA works to champion the cause of electricity regulators in realizing this vision, as evidenced by the following Mission Statement:

> "To facilitate harmonization of regulatory policies, legislation, standards, and practices and to be a platform for effective cooperation among energy regulators within the SADC region."

Membership
Membership to RERA is open to the electricity regulatory bodies in each country within the SADC region. As of December 15, 2015, twelve (12) out of the fifteen (15) countries in the SADC region had established an energy or electricity regulatory authority. However, only the following ten (10) regulatory authorities were members of the association:

- Electricity Control Board (ECB) of Namibia;
- Energy Regulation Board (ERB) of Zambia;
- Energy and Water Utilities Regulatory Authority (EWURA) of Tanzania;
- Institute for Electricity Sector Regulation (IRSE) of Angola;
- Lesotho Electricity and Water Authority (LEWA);
- Malawi Energy Regulatory Authority (MERA);
- National Electricity Advisory Council (CNELEC) of Mozambique;
- National Energy Regulator of South Africa (NERSA);
- Swaziland Energy Regulatory Authority (SERA); and
- Zimbabwe Energy Regulatory Authority (ZERA).

Mozambique has a different regulatory model called the National Electricity Advisory Council (CNELEC), which is essentially an Advisory Board of Commissioners with no executive powers except controlling the arbitration of disputes and the monitoring of the performance of industry players. CNELEC is transforming into an energy regulatory authority and it is anticipated that this process will gain momentum in 2016.

RERA is engaging with the Seychelles Energy Commission, which has just assumed the role of an energy regulator in Seychelles so that it can join the Association. The Office de Regulation de I'Electricite (ORE) of Madagascar is being approached to join RERA following the reinstatement of Madagascar as a member of both SADC and the African Union (AU).

The other three (3) countries without regulators are at various stages of reforms that are expected to lead to the formation of regulatory agencies. The Democratic Republic of Congo (DRC) has passed a new electricity law that provides for the establishment of a regulator, but a decree is yet to be issued to bring the new law into effect. Botswana is still in the process of developing the necessary enabling legislation to pave way for the establishment of a regulator for energy and water sectors. Mauritius is still in the process of making the regulator operational, having promulgated the necessary enabling legislation.

1.2. Objectives of the 2014 Tariff Report

This RERA publication on Electricity Tariffs & Selected Performance Indicators for the SADC Region 2014 serves to support RERA's three strategic objectives mentioned above. More specifically, the objective of the 2014 Tariff Report is to provide a consolidated snapshot of the electricity markets within the SADC region, to include:

- The power sector policy environment, regulatory approaches, and trends in power market development, sector restructuring, and industry reforms;
- The market structure in each of the countries, including key sector players;
- Generation and transmission capabilities across the region;
- Comparative electricity tariffs within Member States and the trend towards cost-reflectivity;
- Regulatory treatment of transmission systems and costs in Member States;
- Key performance and quality of service indicators that characterize the ESI; and

- Policy and regulatory reforms and principles in the region to encourage greater renewable energy project development.

In order to provide context for comparisons of energy markets across the SADC region, the 2014 Tariff Report provides an abbreviated overview of key demographic and economic indicators within each of the countries included. The target audience includes government ministries and policy makers, regulators, utilities, project developers, investors, ESI practitioners, academia, non-governmental organizations, and any other parties taking an interest in regional trends on power market development and in electricity tariffs.

1.3. Improvements in the 2014 Tariff Report

Based on feedback from the target audience and member regulators following prior years' reports, the 2014 Tariff Report includes several enhancements over past publications. At a regional workshop in late-2014, RERA members and the Deloitte team discussed and approved an action plan containing recommendations on improving the quality and relevance of future tariff publications. The action plan comprised of three overarching priorities:

Priority One: Enhance the Tariff Report's Relevance to Investors and Developers

Priority Two: Improve the Data Collection Process

Priority Three: Improve the Quality, Completeness, and Integrity of Data and Content (including incorporating best practice approaches to cost reflectivity)

RERA members then approved a list of specific actions within these three priorities to improve the quality, usefulness, and expediency of future tariff publications. These priorities and specific actions that have been incorporated into the 2014 Tariff Report are highlighted in Table 1-1 below:

Table 1-1: 2014 Priorities and Action Items for 2014 Report

Priority	Action Step	Impact on 2014 Report
1. Enhance the Tariff Report's Relevance to Investors and Developers	Introduce a section on ESI market structure for each member country	Provides important context on issues and challenges within SADC member countries
	Condense and target demographic and economic indicators section	More focused approach, allows for more direct comparisons
2. Improve the Data Collection Process	Create process map with specific timelines and due dates for Tariff Report publication	Improves consistency and timeliness of future reports
	Utilize web-based data collection tools	Improves data quality, allows for multi-year comparisons
	Clarify the list of definitions and acronyms	Greater transparency and accuracy of terminology used

Priority	Action Step	Impact on 2014 Report
3. Improve the Quality and Integrity of Data and Content	Use consistent data time frames	Improved consistency
	Use consistent data sources	Fewer data distortions and easier cross-comparisons
	Improve the structure of the RERA statistical database	Simplifies multi-year reporting, improves accuracy
	More in-depth review on regional supply and demand summaries	More helpful to investors in market sizing and projections
	More in-depth validations on key data and tariff indicators	Greater transparency and accuracy of data
	Incorporate best practices approach to cost reflectivity	More expanded data and answers addressing cost-buildup approaches

In addition to the actions above, the 2014 Tariff Report includes new content and expanded sections to further address inquiries and recommendations made by target audience members. Content changes include the following:

- Expanded discussion of policy and regulatory approaches which encourage renewable energy generation;
- Additional emphasis on transmission policies and networks throughout the SADC region; and
- Key Performance Indicators (KPIs) and Quality of Service factors and how they are factored by regional regulators into tariff methodologies.

We hope that readers will value these improvements and continue to provide feedback on how RERA and the member regulators can increase the effectiveness of future tariff reports.

1.4. Sources of Data Included in the Report

The majority of the data used in the analysis and drafting of this report was collected from RERA member countries through the RERA 2014 Tariff Report Survey. However, the report also contains data that was obtained from third party sources in cases where member regulators did not provide information. In particular, data presented in the *Market Structure* section of this report was obtained from the International Energy Agency (IEA), US Energy Information Administration (EIA), and the World Bank. Information from these sources includes the IEA Statistics website (https://www.iea.org/statistics/), EIA International Energy Statistics site (http://www.eia.gov/beta/international/index.cfm), and the World Bank's online data bank (http://data.worldbank.org/country). Demographic and economic data and analyses included in this report was obtained from the World Bank, the World Economic Outlook 2014 Report, and the International Monetary Fund data bank. Finally, certain tariff information provided by RERA member regulators was denominated in local currencies, which was converted to U.S. dollar denominated rates for comparability. Conversion rates of local currencies to U.S. dollars were calculated based on 2014 World Bank official exchange rates as provided in the World Bank's World Development Indicators Catalog. The World Bank official exchange rates are based on rates determined by national authorities or on rates determined in the legally sanctioned exchange market. They are calculated as an annual average based on month-end averages for the currencies relative to the U.S. dollar.

1.5. Data Collection and Analysis Process

The RERA survey questionnaire, on which the 2014 Tariff Report is based, was distributed by RERA to all member regulators and member states in October 2015. The data collection process for the 2014 Tariff Report represented a major improvement from the preceding years, and we are grateful to member regulators for the timeliness and comprehensiveness of the information submitted this year. Deloitte advised and assisted the RERA Secretariat and Steering Committee in drafting the 2014 Tariff Report from December 2015 through March 2016. The data contained herein and the analysis thereof is based on the submissions made by member regulators and member states. The following ten countries submitted data to RERA as of the publication date:

1. Angola
2. Lesotho
3. Malawi
4. Mozambique
5. Namibia
6. South Africa
7. Swaziland
8. Tanzania
9. Zambia
10. Zimbabwe

2.0. Demographic & Economic Indicators

The following section provides an abbreviated analysis of the demographic and economic indicators in the SADC region. Table 2-1 below shows the population, economic growth indicators, and inflation for the SADC region in 2014.

Table 2-1: Demographic & Economic Indicators (2014)

Country	Population (million 2014)	Population Growth (2014)	Population Growth (5 Yr. CAGR)	2014 GDP (Billion USD)	GDP Growth (2014)	GDP Growth (5 Yr. CAGR)	Inflation (2014)	Inflation (5 Yr. Avg)
Angola	24.4	3.0%	3.0%	129.326	4.8%	4.8%	7.3%	10.9%
Botswana	2.1	1.2%	1.2%	15.217	4.4%	6.6%	3.9%	6.5%
DRC	79.3	3.0%	3.0%	35.918	9.2%	7.7%	1.0%	8.6%
Lesotho	1.9	0.3%	0.3%	2.22	3.5%	4.7%	3.8%	4.8%
Madagascar	23.6	2.8%	2.8%	10.674	3.3%	2.1%	6.1%	7.3%
Malawi	17.6	2.9%	2.9%	6.055	5.7%	4.9%	23.8%	17.7%
Mauritius	1.3	0.0%	0.2%	12.588	3.6%	3.6%	3.2%	4.0%
Mozambique	26.5	2.5%	2.5%	16.684	7.4%	7.3%	2.3%	6.3%
Namibia	2.2	1.4%	1.4%	13.632	4.5%	5.2%	5.3%	5.5%
RSA	54.0	1.6%	1.5%	350.082	1.5%	2.4%	6.1%	5.3%
Seychelles	0.1	1.4%	1.4%	13.632	4.5%	5.2%	5.3%	5.5%
Swaziland	1.1	1.2%	1.2%	4.416	2.5%	2.2%	5.7%	6.2%
Tanzania	46.7	2.0%	2.3%	48.089	7.0%	6.7%	6.1%	10.0%
Zambia	15.0	3.3%	3.2%	26.611	5.6%	7.1%	7.8%	7.7%
Zimbabwe	13.3	1.1%	1.6%	13.833	3.3%	8.3%	-0.2%	2.3%

Source: International Monetary Fund, World Economic Outlook Database, October 2015

2.1. SADC Population

The SADC region had an estimated population of 273 million in 2009. The regional population grew by a compounded average of 2.5% per annum from 2009 to 2014 and, by 2014, the population had grown to 309 million. Over this period, the fastest growth was experienced between 2011 and 2012 when the population grew by 2.5% from 287 million to 294 million. Zambia and Angola recorded the highest population growth in percentage terms between 2013 and 2014, at 3.3% and 3.0% respectively. In compounded growth terms, Zambia, Angola, and the DRC experienced the highest population growth in percentage terms between 2009 and 2014, at 3.2%, 3.0%, and 3.0% respectively.

2.2. Economic Growth in the SADC Region

According to the World Economic Outlook, moderate domestic demand is expected to continue and support growth in the medium term, although at lower levels than in the past two years. This directional trend reflects tighter global financial conditions and declining global commodity prices, to which many of the countries in the region are sensitive. A modest fiscal consolidation was projected for 2015, but fiscal deficits will remain elevated as governments maintain their investment programs while revenue stays low. Reflecting this moderating domestic demand, current account deficits were projected to widen from 2014 to 2015 before narrowing in 2016. Economic growth in SADC differs greatly among member countries, reflecting such factors as dependence on commodity prices and agricultural output. On average, gross domestic product (GDP) per capita increased by 3% per year in SADC over the last decade. There are important distinctions in growth within the region. While a country such as Angola enjoyed more than 7% GDP growth per capita annually over the last decade, the per capita income of a country such as Zimbabwe decreased by 2.8% annually over the same period.

The U.S. Federal Reserve's reduction of asset purchases was not expected to have a major impact on countries in the region, owing to their limited integration in global financial markets. However, South Africa, which has strong links with global financial markets, remains particularly vulnerable to capital outflows given its reliance on portfolio inflows to finance current account deficits. Frontier market countries that have seen significant portfolio inflows in local securities markets would also be affected by the reversal of capital flows, and countries that are planning to tap the international bond markets are likely to face higher coupon rates as economic growth rates decline and perceived repayment risks begin to increase.

When looking at individual countries, South Africa continues to have the largest economy in the region. Its share of the region's total GDP stands at 55.5%, albeit down from 63% in 2010. Angola's economy is the region's second largest, with a share of 13.6%. Among the smallest regional economies, Lesotho and Seychelles have shares of regional GDP totaling 0.4% and 0.2% respectively.

2.3. Inflation in SADC Countries

Historically, inflation rates have been highly volatile throughout the SADC region. Low, stable levels of inflation are ideal, which allow businesses to grow without drastically reducing the savings and purchasing power of the population.

Member states have observed better performance in terms of stabilizing inflation since SADC passed the Memorandum of Understanding in 2002. The average level of inflation for the region decreased from 23% in 2008 to 5.6% in 2014. Excluding the effect of inflation in Zimbabwe in 2008, the average level of inflation was 13.2% in 2008 and 7.4% in 2014. Most Member States currently experience single-digit rates of inflation, with the exception of Malawi which had 2014 inflation of 23.8%. On the lower end of inflation, Zimbabwe and the DRC have the lowest inflation levels in the region at -0.21% and 1.0% respectively.

While the rate of inflation has greatly subsided in most SADC member states, it remains high in comparison with nations outside the region and thus remains an area of concern for economic development. Furthermore, although inflation has dropped, interest rates remain high, which can hinder borrowing and

investment. However, high interest rates are a direct result of the tight monetary policies intended to curb inflation.

Many of the challenges outlined above stem from the level of economic development in the SADC region. Most member states are still developing their economies and infrastructure, which contributes to volatility in inflation.

3.0. Tariffs

3.1. Cost Reflectivity

The drive towards cost-reflective tariffs remains a top priority for member regulators in the SADC region. Originally, SADC had tasked its member states to adopt cost reflective tariffs by 2013. While several countries have made significant progress in reforming their tariff methodologies, other countries' tariffs remain below full-cost reflectivity or are impacted by different forms of subsidy payments.

Cost reflectivity is a necessary condition for the long term viability and sustainability of the ESI for all countries in the SADC region. Tariffs that are set at a level that allow utilities to cover their full costs of providing service have many benefits, including:

1. More likely to attract private sector investment into IPPs;
2. Lead to more creditworthy and financially viable utilities;
3. Often increase regional cross-border electricity trade;
4. Encourage the appropriate and efficient use of scarce resources; and
5. Facilitate a self-funding power sector that allows governments to reallocate scarce resources to other high priority needs (e.g., education, healthcare).

As defined in the 2014 Tariff Report, cost reflective tariffs reflect the true cost of supplying electricity, removing reliance on external subsidies to cover the variance between the current tariffs and the true cost of electricity supply. Costs are allocated in entirety to those customers who consume electricity services. Factors impacting true cost include location, time and pattern of use, existing network connections, and impact of other users. Inputs that make up the cost of supplying electricity include: 1) a fixed charge, reflecting the capacity investment required to operate the electricity system - fixed charges do not change based on demand patterns, and 2) variable charges, which are directly impacted by changes in input costs and consumer behavior. Cost reflective tariffs capture the fixed charge to provide service to all customers, plus the variable charge directly impacted by consumption patterns. Cost-reflective tariffs seek to recover all the costs of delivering energy services to specific customer classes, net of any subsidies or government funds transfers to cover shortfalls. Short run marginal costs tend to be low in the electricity sector because capacity cannot be expanded quickly, but long run marginal costs become variable and higher as capacity is added or removed to adjust to changing demand patterns.

In determining progress towards cost-reflective tariffs across the SADC region, regulators receiving the survey questionnaire were asked to answer the following questions:

1. Are current tariffs sustainable and sufficient to provide incentives for new investments?
2. Are current tariffs able to provide incentives for efficient use of electricity?
3. Has a target date been set for achieving cost reflectivity?
4. Is there an approved or agreed plan to achieve cost-reflective tariffs target?

The responses to the questionnaire are displayed in Table 3-1 below. A check mark indicates a "yes" response, an "x" indicates a "no" response, and a blank box indicates no response was given.

Table 3-1: Progress towards Cost-reflective Tariffs 2014

Country	1. Are current tariffs sustainable and sufficient to provide incentives for new investment?	2. Are current tariffs able to provide incentives for efficient use of electricity?	3. Has a target date been set for achieving cost reflectivity?	4. Is there an approved plan to achieve cost-reflective tariffs target?
Angola	×	×	✓	✓
Lesotho	✓	×	×	×
Malawi	×	×	✓	✓
Mozambique	×	×	×	×
Namibia	✓	✓	✓	✓
RSA	✓	✓	✓	×
Swaziland	×	×	×	×
Tanzania	✓	✓	×	×
Zambia	×	×	✓	✓
Zimbabwe	×	×	×	×
Total	**4**	**3**	**5**	**4**

Source: RERA Database 2014

Although all SADC member states formally announced a target in 2008 to adopt cost-reflective tariffs by 2014, only four regulators – Lesotho, Namibia, South Africa, and Tanzania – felt that the tariffs in their countries were sustainable and sufficient to provide incentives for new investments. Three of the four countries –Namibia, South Africa, and Tanzania - also reported to have tariffs that created incentives for the efficient use of electricity. Among other countries, four regulators – Angola, Malawi, Namibia, and Zambia – responded that they had an approved plan to achieve cost-reflective tariffs in place. Angola has set a target to achieve cost-reflective tariffs by 2020, consistent with the goal recently set by SADC region energy ministers.

Among countries that answered "no" to questions 1 and 2 above, three regulators reported that political pressure and domestic political considerations are the greatest barriers to achieving cost reflective tariffs, especially with regard to poor customers. One regulator responded that subsidies paid by the government for generation are the greatest barrier.

3.2. Tariff Structure

In determining the tariff structure in each of the regional countries, regulators from each of the RERA member countries were asked to provide details to the following questions:

1. Do separate transmission tariffs exist in your country?
2. Do distinct ancillary services tariffs exist in your country?
3. Do you have time-of-use tariffs?
4. Does your tariff structure allow for lifeline tariffs?

The responses to the questionnaire are displayed in Table 3-2 below, utilizing the same response indicators as in earlier tables. While the ESI's in both Namibia and Tanzania are dominated by vertically integrated utilities, regulators in both countries have established methodologies for specific transmission tariffs. When rates for each of the distinct services (generation, transmission, and distribution) are unbundled, it becomes easier to identify where inefficiencies lie within the ESI value chain. The Malawi regulator reported an expectation to move towards transmission tariffs in that country's methodology, given the utility unbundling currently being planned out.

At present, no countries in the region have specific ancillary services tariffs, or specific criteria in their methodology to define ancillary service tariffs. We note that in the 2012/2013 Tariff report, South Africa and Mauritius acknowledged having separate tariffs for ancillary services. It is important that the costs associated with ancillary services be determined and acknowledged if the region is to progress towards cost reflectivity.

Several countries have components in place defining both time of use and lifeline tariffs. Three countries (Mozambique, Tanzania, and Zimbabwe) have defined consumption limits for their lifeline tariff rates at between 50 – 100 kWh per month.

Table 3-2: Summary of Tariff Structure (2014)

Country	Type of Tariff			
	1. Transmission	2. Ancillary Services	3. Time of Use	4.Lifeline
Angola	×	×	×	
Lesotho	×	×	×	×
Malawi	×	×	✓	×
Mozambique	×	×	×	✓
Namibia	✓	×	✓	×
RSA	×	×	✓	✓
Swaziland	×	×	✓	✓
Tanzania	✓	×	×	✓
Zambia	×	×	✓	✓
Zimbabwe	×	×	✓	
Total	**2**	**0**	**6**	**5**

Source: RERA Database 2014

The majority of the SADC regulators expect more changes in their tariff methodology and structure in the next year. These include further segmentation of tariff categories and charges, responses to utility unbundling efforts, and greater detail in establishment of generation tariffs. This confirms that the electricity supply industry in the region is still in flux. However, the continued tariff reforms and progress towards cost-reflectivity expected by regulators supports the claim that the SADC region is migrating towards greater transparency and accuracy in tariff setting. Table 3-3 below shows the tariff structure changes reported by regulators in the survey.

Table 3-3: Expected Changes to Tariff Structure (2014)

Country	Change in Structure?	Expected Changes
Angola	Yes	
Lesotho	No	
Malawi	Yes	Due to impending unbundling, there is need to develop transmission tariff methodology
Mozambique	No	
Namibia	No	
RSA	Yes	Changes will depend on results of the cost of supply study
Swaziland	No	
Tanzania	Yes	Changes in the tariff structure to accommodate periodic adjustments
Zambia	No	
Zimbabwe	Yes	Accommodating higher cost generation to come online
Total	**5**	

Source: RERA Database 2014

Market Component Tariffs

Given that most of the utilities in the region are vertically integrated, most of the respondents to the 2014 Tariff Survey were unable to provide prices for the generation, transmission, distribution, supply, and balancing components of the tariffs in their countries. Namibia, Tanzania, and Angola were able to provide tariff information on various separate components in their respective ESI's.

In Lesotho, tariffs are not determined by components, but on a basis that covers all the costs incurred in the various operations of the utility. Lesotho's generation tariff is approved by the regulator through a power purchase agreement (PPA). In Swaziland, the tariffs are not separated into components. However, the tariff methodology requires that each component be shown by the utility during the tariff application and review process.

Final Customer Tariff Determination

In the vast majority of cases in the Southern African region, the regulators are responsible for developing tariff methodologies, rates, and procedures of final customer tariffs. The sole exception to this is Mozambique, where the state utility is responsible for developing procedures, rates, and procedures of final customer tariffs. In Lesotho, the Department of Energy is responsible for setting and approving tariffs for rural systems.

Tariff Determination

There is still great diversity in the tariff methodologies used to determine the price of electricity services in the region. This underpins a key challenge in developing regional IPP projects in the SADC region. Depending on which countries and utilities have participation in regional IPPs, a project developer or operator may be required to adhere to three different regulatory methods used to determine tariffs. Regulators were asked in the questionnaire to identify the primary tariff methodology used to determine tariffs for the different operating segments in their electricity supply industries. Regulators across the region predominantly rely on Rate of Return or Cost Plus methodologies to determine tariff rates, although hybrid approaches are applied in some situations. Table 3-4 below summarizes the methods as reported by the regulators.

Table 3-4: Tariff Determination Methods

Country	Generation	Transmission	Distribution	Supply
Angola	Revenue Cap	Revenue Cap	Revenue Cap	
Lesotho				Cost Plus
Malawi				Cost Plus
Mozambique				Rate of Return
Namibia	Cost Plus	Cost Plus	Cost Plus	
RSA	Cost Plus	Cost Plus	Hybrid	
Swaziland			Cost Plus	
Tanzania	Rate of Return	Rate of Return	Rate of Return	
Zambia	N/A	N/A	N/A	Cost Plus/Incentive based
Zimbabwe	Rate of Return	Rate of Return	Rate of Return	Rate of Return

Source: RERA Database 2014

It is also important to note that, the diversity of methodologies notwithstanding, most of the countries in the region do not have price caps included in any of the components in their tariff structure. The sole exception to this is Tanzania, which has price caps applied based on customer groups.

Similarly, the vast majority of countries do not have revenue caps included in their tariff methodologies. Of the ten countries that provided data, eight indicated they do not have revenue caps. Two countries – Angola and Malawi - indicated they have revenue caps. In Malawi, the revenue caps are determined using efficiency, volume, and quality. In Angola, the revenue caps are determined using inflation and efficiency.

Of the ten countries that provided data, three countries indicated they utilize an applied incentive methodology in their tariff determination. The three countries – South Africa, Tanzania, and Zambia- have utilized the applied incentive method over a one year, five years, and three years regulatory period, respectively. All regulators indicated that there is no profit sharing mechanism applied in tariff determination.

Multi-Year Tariffs

A Multi-Year Tariff (MYT) framework is defined as a framework for regulating the licensees over a period of time wherein the principles of regulating the returns of licensees and the trajectory of individual cost and revenue elements of the utility are pre-determined. It provides clarity on the rules to be applied over a pre-defined future time period while seeking to eliminate the control aspects of regulation and replacing them with a system of incentives and penalties. In this way, all stakeholders are made aware of the outcome of various actions/events for the pre-defined future time period, and are able to plan accordingly. In relation to the SADC region, the adoption of multi-year tariffs could help to provide important price signals and tariff transparency to investors and developers.

The majority of countries in the SADC region do not have a multi-year tariff regime in place. Malawi, South Africa, Swaziland, and Tanzania are the only countries that have instituted a multi-year tariff methodology in some format. Of these, South Africa has the longest duration of application, currently set at a five year determination horizon. Malawi operates with a four year methodology, Tanzania with three years, and Swaziland with two years.

Tariff Customer Groups

As detailed in the *Cost of Service Primer* that was part of the 2012/2013 Tariff Report, an important step in determining cost reflective tariffs is the regular undertaking of cost of service studies. The purpose of a cost of service study is to compare a utility's revenues to revenue requirements by customer groups. The process of determining the cost of service – and therefore establishing a cost reflective tariff – for each customer category will at the least require disaggregating the utility's costs into functions (generation, transmission, and distribution), and services rendered by the utility. The functionalized costs of providing service are first classified by cost components and then allocated to each class of service based on the specific service characteristics of that particular customer group (such as power delivery infrastructure used, voltage levels, etc.). In the SADC region, all of the countries have defined industrial, residential, and commercial customer groupings. Additionally, some countries have defined additional customer groups including agriculture customers and public lighting users. Other countries, such as Zambia have defined more specialized customer groups such as mining, residential, services, commercial, large power, and small power customer groups. Lesotho has a small commercial group that is not demand metered, and Zimbabwe has a customer group defined as mining, pumping works, and institutions. Table 3-5 below shows the various defined customer groups in each of the respondent countries.

Table 3-5: Tariff Customer Groups In SADC Region (2014)

Country	Industrial	Residential	Commercial	Agricultural	Public Lighting	Other
Angola	✓	✓	✓		✓	
Lesotho	✓	✓	✓		✓	Small commercial

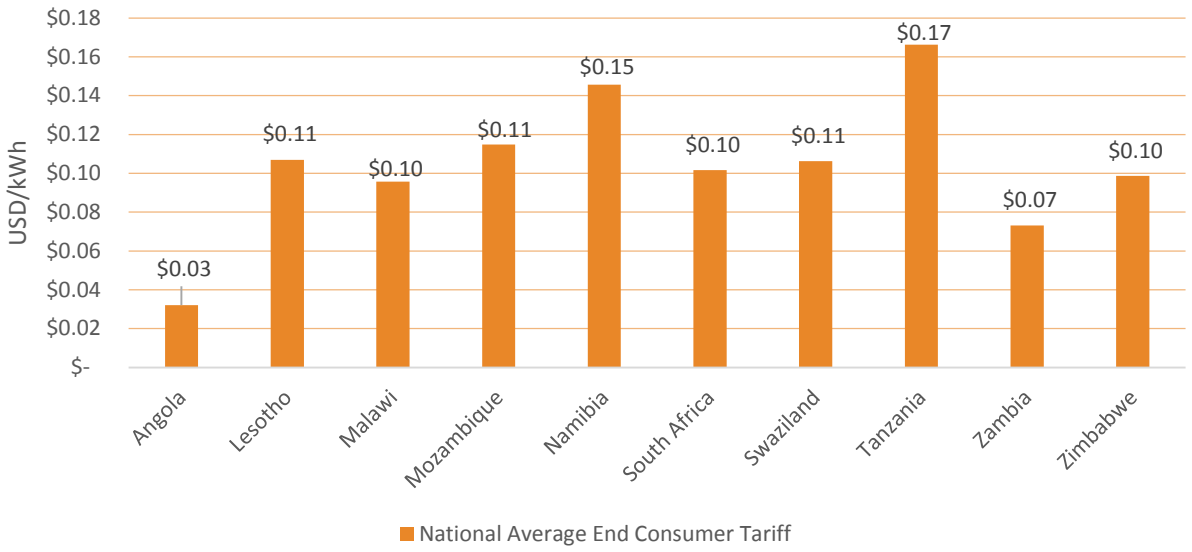
Country	Industrial	Residential	Commercial	Agricultural	Public Lighting	Other
Malawi	✓	✓	✓			
Mozambique	✓	✓	✓	✓		Low voltage
Namibia	✓	✓	✓	✓		
RSA	✓	✓	✓	✓	✓	
Swaziland	✓	✓	✓	✓		Time of Use
Tanzania	✓	✓	✓			Large mines and Bulk supplier
Zambia	✓	✓	✓		✓	Mining
Zimbabwe	✓	✓	✓	✓	✓	Mining, Pumping works and Institutions

Source: RERA Database 2014

3.3. Consumer Tariff Levels

As can be seen in Figure 3-1 below, consumer tariffs still differ widely within the region. This range is partially explained by the different variable costs in the region, such as fuel input prices, but also by the varying levels of subsidies still paid into the sector in some countries. As indicated before, while the consumer tariff information was provided in local currencies, to ensure comparability, the rates were all converted to U.S. dollars using the 2014 average exchange rates as provided by the World Bank. As reported, Angola and Zambia have the lowest average consumer tariffs of three (3) US cents and seven (7) US cents respectively. On the other hand, Namibia (15 cents) and Tanzania (17 cents) have the highest average end user tariffs in the region.

Figure 3-1: Reported National Average Consumer Tariffs (2014)



Source: RERA Database 2014

Consumer tariffs vary across the region based on energy consumption levels. In some countries, consumer tariffs have incremental cost escalations as household consumption levels increase. The 2014 Tariff Report requested that respondents answer the following question:

> "Please summarize the monthly electricity bill and retail tariff rate paid by domestic consumers, based on the following levels of monthly consumption (75kWh, 200 kWh, 500 kWh, and 1,000 kWh), under your current tariff structure."

Table 3.6 below compares the consumer tariff rates across the SADC region, based on increasing household consumption levels. Charges in local currencies are converted to dollars based on World Bank 2014 official exchange rates. This comparison allows for an equalizing comparison of tariffs paid in different countries for households that consume different levels of energy. Most tariff structures in the region consist of a single base-rate tariff for incremental consumption between the sample consumption levels of 75 kWh – 1,000 kWh per month. The exceptions are South Africa, Tanzania, and Zimbabwe, which have introduced escalating tariff rates tied to higher household consumption patterns. The tariff structures in these three countries reflect a lifeline tariff rate at a lower level, with graduated incremental cost per kWh increases as consumption patterns increase. As countries seek to remove subsidies paid into their electricity sector, balancing the tariff structure based on tiered consumption levels provides a potentially viable policy option. The tariff structures shown in South Africa, Tanzania, and Zimbabwe provide consumption-based examples that regulators in other countries can emulate.

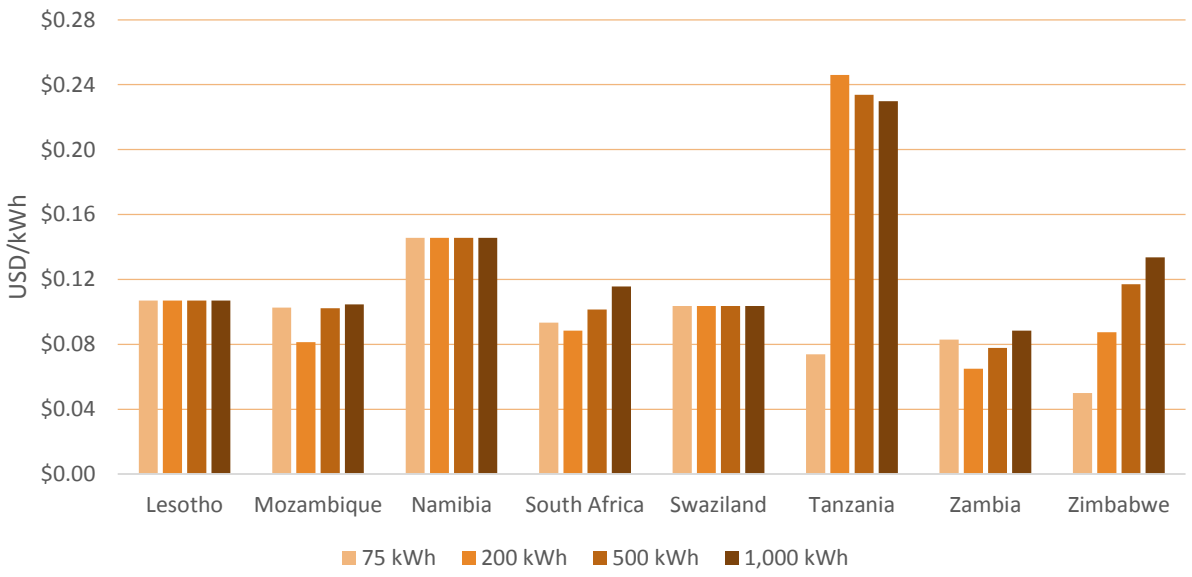
Table 3-6: Domestic Consumer Tariffs Based on Consumption Levels

Country	Monthly Consumption Level (kWh)	75 kWh	200 kWh	500 kWh	1,000 kWh
Lesotho	Total Bill (USD)	8.02	21.38	53.44	106.89
	US$/kWh	0.11	0.11	0.11	0.11
Mozambique	Total Bill (USD)	7.70	16.28	51.11	104.59
	US$/kWh	0.10	0.08	0.10	0.10
Namibia	Total Bill (USD)	10.92	29.12	72.79	145.59
	US$/kWh	0.15	0.15	0.15	0.15
RSA	Total Bill (USD)	7.00	17.69	50.68	115.73
	US$/kWh	0.09	0.09	0.10	0.12
Swaziland	Total Bill (USD)	7.76	20.70	51.76	103.52
	US$/kWh	0.11	0.11	0.11	0.11
Tanzania	Total Bill (USD)	5.53	49.21	116.92	229.78
	US$/kWh	0.07	0.25	0.23	0.23
Zambia	Total Bill (USD)	6.22	13.00	38.84	88.33
	US$/kWh	0.08	0.07	0.08	0.09
Zimbabwe	Total Bill (USD)	3.75	17.50	58.50	133.50
	US$/kWh	0.05	0.09	0.12	0.13

Source: RERA Database 2014

Lesotho, Swaziland, and Namibia did not report having incremental tariff increases based on consumption volumes. Some other countries, such as South Africa and Zimbabwe have very differentiated selling prices across the bands. This would suggest that these countries either have cross subsidization between customer consumption bands, or cross subsidization between these domestic customer bands and other customer groups. In other countries, such as Tanzania, where cross subsidization is not allowed, the differentiated selling prices might indicate the inclusion of monthly service charges. It is also important to note that while there are differentiated selling prices for customers in Zimbabwe, as indicated in Table 3-6 above, these differentiated selling prices only apply to customers on traditional meters. Customers who are on prepaid meters pay a flat tariff rate of USD0.10/kWh. Figure 3-2 below shows the tariff rates per band for each of the countries that provided data.

Figure 3-2: Consumer Tariff Levels per Consumption Band



Source: RERA Database 2014

3.4. Tariff Review and Adjustments

During 2014, five regulators reported that their tariff structures allowed for extraordinary tariff adjustments between review periods, such as in cases of significant changes in cost inputs. The five countries that indicated that their tariff structures allowed extraordinary adjustments were: Lesotho, Malawi, South Africa, Tanzania, and Zimbabwe. Three countries indicated that their tariff structures did not allow for extraordinary tariff adjustments: Mozambique, Namibia, and Zambia.

Additionally, only one country – Zimbabwe - indicated that the tariff structure provides for special pricing arrangements for specific customer categories. The special pricing arrangements in Zimbabwe are allowed for mining companies, reflecting volatility in global commodity market prices, and as such their respective tariff is linked to price movements of selected metals on the world market. All regulators reported that regular tariff reviews were allowed in their respective countries at scheduled intervals. In Tanzania, while

there are no special pricing arrangements, electricity legislation directs for periodic adjustments of tariffs to reflect changes in fuel costs, exchange rate fluctuations, and inflation.

Eight regulators reported that consumer tariff increases were approved in their countries during 2014 or 2015. Table 3-7 below provides the percentage increase and revision date to consumer tariffs, as reported by the regulators.

Table 3-7: Consumer Tariff Increases During 2014-2015[1]

Country	Percentage Increase	Tariff Revision Date
Lesotho	12.40%	May 1, 2014
Malawi	13.73%	November 2, 2015
Mozambique	15.00%	November 1, 2015
Namibia	13.22%	July 1, 2014
RSA	12.69%	April 1, 2015
Tanzania	39.19%	January 1, 2014
Swaziland	9.50%	June 1, 2014
Zambia	16.00%	Jul 1, 2014

3.5. Subsidies, Surcharges, and Levies

For 2014, ten countries reported that taxes, levies, and/or surcharges were allowed on tariffs. These countries are depicted in Table 3-8 below, with explanations in the narrative below the table.

Table 3-8: Summary of Subsidies, Surcharges, and Levies 2014

Country	Taxes, Levies, and or Surcharges Allowed	Utilities Receive Subsidies	Utilities Pay Subsidies	Cross Subsidization Allowed
Angola	✓	✓	×	✓
Lesotho	✓	×	×	×
Malawi	✓	×	×	✓
Mozambique	✓	×	×	×
Namibia	✓	×	✓	✓
RSA	✓	✓	×	✓
Swaziland	✓	✓	×	✓
Tanzania	✓	✓	×	×

[1]While this Tariff Report covers the 2014 period, some of the tariff increases were in 2015 due to differences in when fiscal years start for the different utilities.

Zambia	✓	✓	×	✓
Zimbabwe	✓	×	×	×
Total	**10**	**5**	**1**	**6**

Source: RERA Database 2014

Surcharges were reported as normally consisting of value-added taxes (VAT), with levies including a rural electrification charge. Country level examples provided by the regulators include:

- Lesotho: VAT (5%) and Rural Electrification levy (in the range of 3% - 10% for different customer categories) on all tariffs
- Malawi: VAT (16.5%), Rural Electrification Levy (4.5%), and Energy regulation levy (1%)
- Namibia: VAT on all tariffs (15%) except domestic customers, local authority surcharge on distribution tariffs (0.06%), Electricity Control Board and National Electricity Fund Levy (0.011%) on all tariffs
- Tanzania: VAT (18%), Regulatory surcharge (1%), and Rural Electrification levy (3%) on all tariffs
- Zambia: VAT (16%) and excise duty (3%) on all tariffs
- Zimbabwe: VAT on all except domestic customers (15%), Rural Electrification levy (6%) on all tariffs

The percentage of taxes, levies, and surcharges that make up the entire tariff varies widely across customer categories. In Malawi, Tanzania, and Zimbabwe, 22%, 22%, and 21% of the total tariff is comprised of these additional cost components respectively. Lower percentages were reported for Angola (6%) and Namibia (8%).

Four regulators indicated that the utilities in their countries received some form of subsidy. The most commonly reported forms of subsidies included fuel cost subsidies and direct budget allocations (South Africa, Tanzania, and Zambia). In practice, other utilities across the region are likely receiving some form of government support through budget allocations to offset operating losses or cash flow shortfalls. Additionally, some utilities also receive direct government support through budget contributions or through direct contributions to fund individual power plants or transmission infrastructure.

Six regulators indicated that cross subsidization either within or across customer groups was allowed in their countries. The nature of the cross subsidization varies across countries. For example, in Zambia, while cross subsidization is not allowed across customer groups, it is "allowed" within customer groups by way of uniform pricing regardless of geographical location.

4.0. Technical and System Indicators

4.1. Technical Base – Supply and Demand Summary

Supply Demand Balance – SAPP Outlook to 2017

The SADC region as a whole continues to suffer from an energy supply deficit. The full extent of the deficit is difficult to determine, given: (1) the difficulty in estimating suppressed demand in each of the countries, (2) the impact of self-generation, and (3) the proliferation of load shedding in the region. In its 2014 Annual Report, SAPP estimated a regional capacity shortfall of 4,592 MW within the twelve countries that make up the mainland SADC region.

Table 4-1 below presents installed and available capacity (taking into account planned and unplanned outages) for SAPP member utilities, as of February 2014. This data excludes Madagascar (544 MW installed), Mauritius (900 MW installed), and Seychelles (90 MW) since they are not currently connected to mainland Southern Africa and are not SAPP members.

Table 4-1: SAPP Supply Situation 2014/2015

Country	Utility	Installed Capacity (2014/2015) (MW)	Available Capacity (2014/2015) (MW)
Angola	ENE	2,210	1,805
Botswana	BPC	892	460
DRC	SNEL	2,442	1,485
Lesotho	LEC	72	72
Malawi	ESCOM	351	351
Mozambique	EDM/HCB	2,308	2,279
Namibia	NamPower	501	392
RSA	Eskom	46,963	41,074
Swaziland	SEC	70	70
Tanzania	TANESCO	1,380	1,143
Zambia	ZESCO/CEC/LHPC	2,128	2,029
Zimbabwe	ZESA	2,045	1,600
Total SAPP		**61,363**	**52,760**

Total Interconnected SAPP[2]	**57,422**	**49,461**

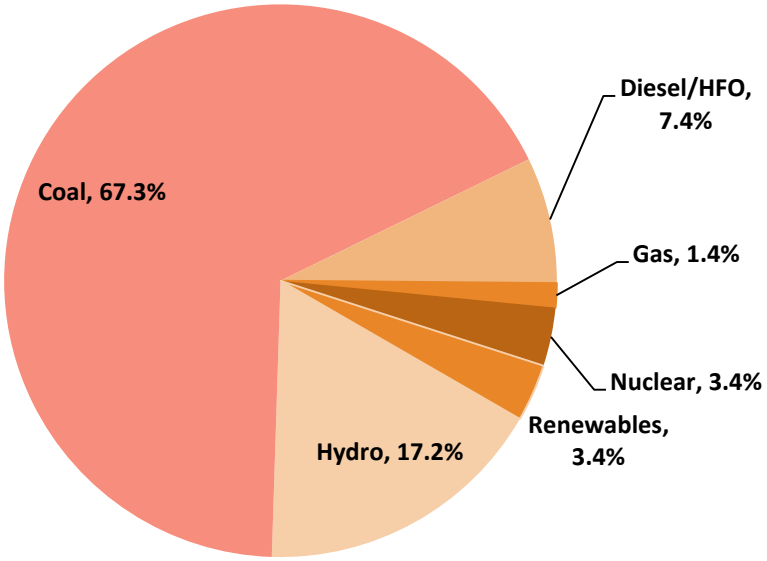
Source: SAPP 2015

Generation Mix – Fuel Type

As shown in Figure 4-1 below, during 2014, coal fired power plants accounted for approximately 67% of the total installed generation capacity in the SADC region. This is largely attributable to South Africa's continued, extensive reliance on coal fired power plants. Going forward, we expect the proportion of coal fired generation capacity in South Africa to increase as Kusile and Medupi come on-line. The percentage increase will, however, be tempered by the increased focus on renewable energy generation across the region and the eventual; completion of large gas-fired and hydropower projects in the coming years.

Comparing these proportions to 2013, we note that the proportion of coal fired installed generation declined during the year, from approximately 74% to 67% in 2014. This was accompanied by a significant increase in renewable technologies, (from 0.7% to 3.4%). Additionally, we noted a significant increase in diesel/HFO installed generation, which increased from 1.7% in 2013 to 7.4% in 2014.

Figure 4-1: Proportion of Installed Generation by Fuel Type (2014)



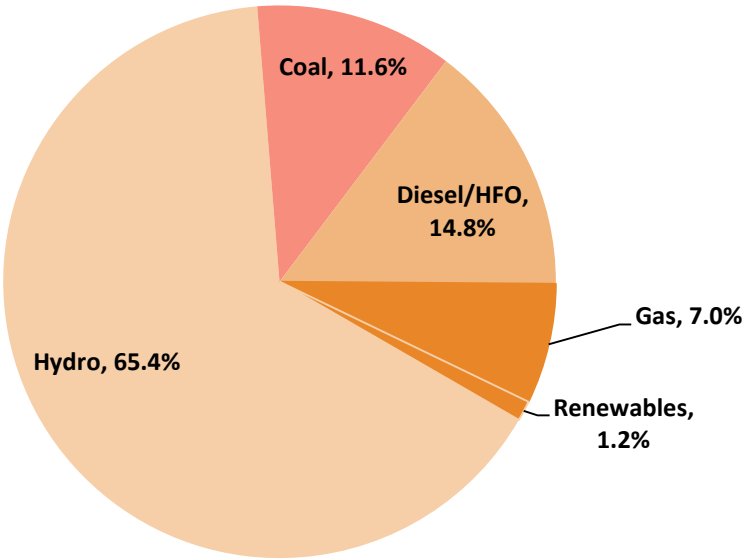
[2] Nine (9) SADC countries with a total of thirteen (13) SAPP members are interconnected and hence can trade among each other while the other three namely ENE of Angola, ESCOM of Malawi and TANESCO of Tanzania are not yet interconnected and hence cannot trade regionally. Two are independent power producers while the other two are independent transmission companies.

Source: RERA Database 2014

When excluding South Africa from the comparison, the proportions of the region's installed generation capacity by technology differ markedly. For example, in 2014 the region's installed capacity excluding South Africa was dominated by hydro, which accounted for approximately 65% of the total (comparison is shown in Figure 4-2 below). The SADC Regional Master Plan has prioritized four large hydropower projects for development by 2020 that would continue to migrate the region's energy mix away from coal if completed. These projects include Mpanda-Nkuwa in Mozambique (1,500 MW), INGA III in DRC (4,200 MW), Batoka on the Zambezi River (1,600 MW) and the Lesotho Highlands Water Project Phase II (unspecified capacity).

It is noted that these proportions changed dramatically compared to 2013, and this is attributed to project completions in the region. According to SAPP, 1,999 MW in new installed capacity came on-line during 2014 and the vast majority of the new installed capacity in the region came from hydro capacity. As such, hydro increased from 58% in 2013, to 65% in 2014.

Figure 4-2: Proportion of Installed Generation by Fuel Type, Excluding South Africa (2014)

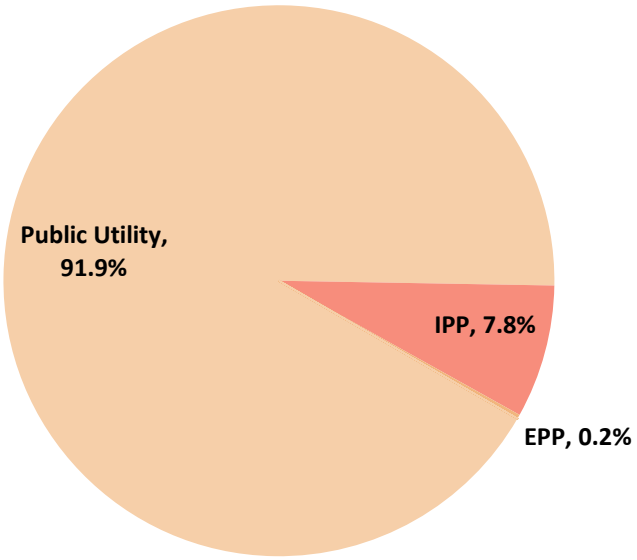


Source: RERA Database 2014

Generation Mix – Private vs. Public

The SADC region is still overwhelmingly dependent on government-owned state utilities for power generation. As shown in Figure 4-3 below, IPPs constitute less than 10% of the installed generation capacity across the region.

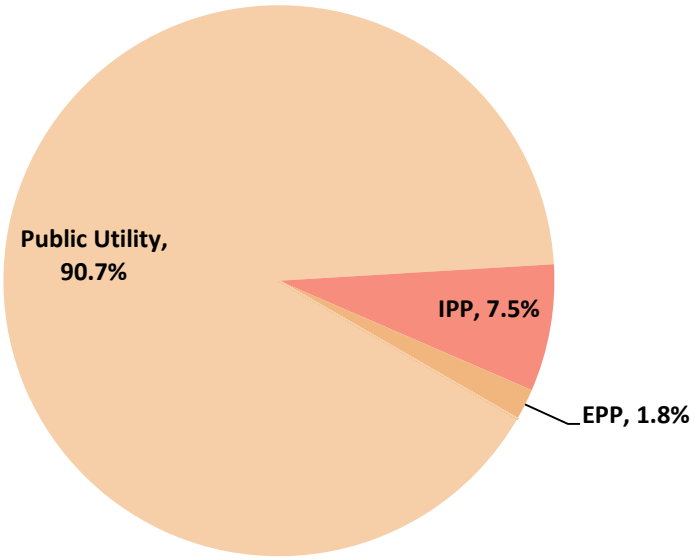
Figure 4-3: Generation Mix Private vs. Public



Although public utilities represent approximately 92% of all the installed capacity, IPPs continue to grow incrementally as a percentage of the total generation mix. South Africa's REIPPPP program has been a contributing factor to the increased percentage of IPPs. As Tanzania's Emergency Power Producers are phased out, this percentage will be reduced to zero.

By excluding South Africa from this comparison, the ratio of public to private generation ownership changes marginally. Figure 4-4 below shows the breakdown of the installed capacity by source when South Africa is removed.

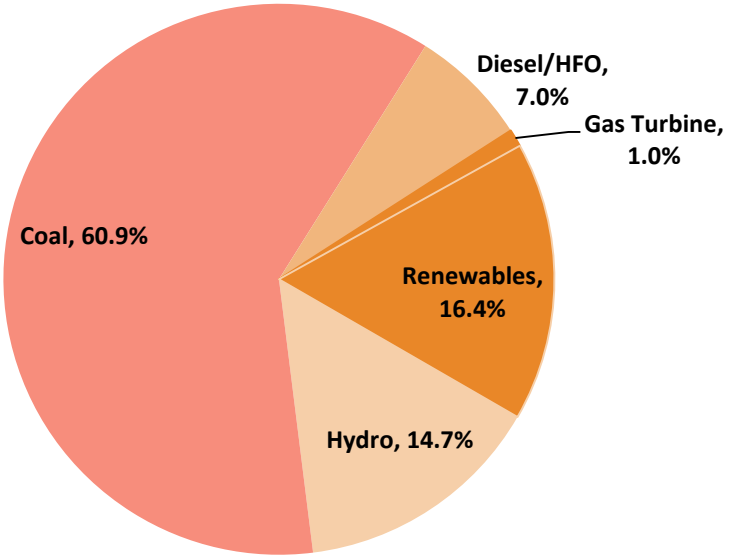
Figure 4-4: Generation Mix by Source (Ex. RSA)



Generation Mix – Capacity under Construction

The trends in generation capacity planned and under construction mirrors the trends in the existing capacity with some interesting differences. As shown in Figure 4-5 below, coal accounts for the lion's share of installed capacity, followed by renewables and hydropower. This is largely due to planned coal-fired generation capacity additions in South Africa, and to South Africa's ongoing REIPPPP program, which has contributed 3 GW of renewable energy generation capacity to the national grid. Several countries including Mozambique, Namibia, and Tanzania are actively working on the development of new gas-fired generation projects with private sector partners. Gas projects being evaluated include Mtwara in Tanzania and the Xaris floating LNG terminal in Namibia.

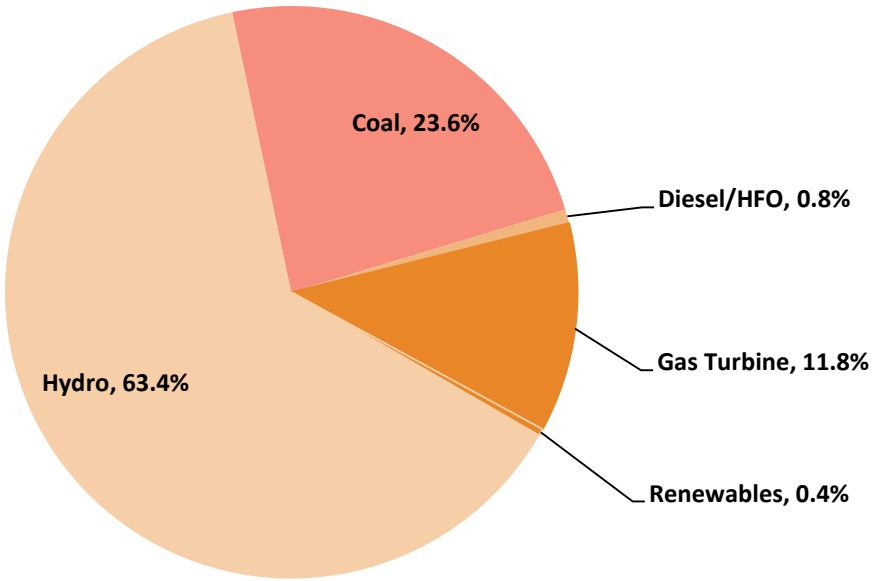
Figure 4-5: Capacity under Construction by Fuel Type



Source: RERA Database 2014

Figure 4-6 below shows the capacity under construction in the region excluding South Africa. The situation closely mirrors the installed generation capacity in the rest of the region. Hydro represents the majority of the capacity under construction, reflecting the priority projects under the SADC Regional Master Plan that are moving forward. As stated earlier, several large gas-fired projects are also migrating towards financial close and commercial operation in multiple countries. In contrast to Figure 4-5 above, diesel/HFO is approximately double the capacity under construction as compared to renewables. This reinforces the fact that only South Africa has been successful at bringing utility-scale renewables generation to commercial operation. This challenge continues to change across Sub-Saharan Africa as additional utility scale renewables projects reach financial close. An example includes the Lake Turkana wind project in Kenya, which will scale to 300 MW of new generation capacity when completed.

Figure 4-6: Generation Capacity under Construction by Fuel Type (Excl. RSA)

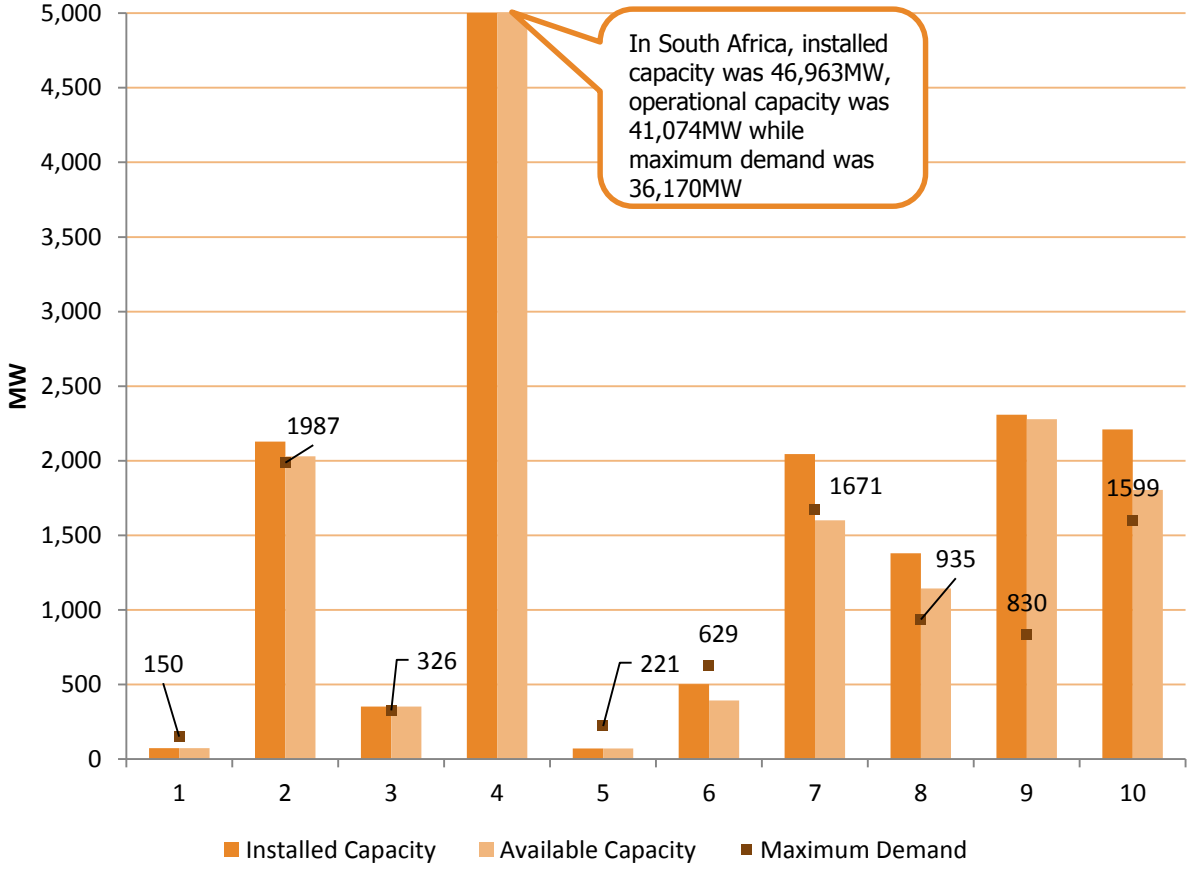


Source: RERA Database 2014

Generation Available to Meet Demand

Figure 4-7 below shows the difference between nameplate capacity, operational capacity, and system maximum peak demand.

Figure 4-7: Installed Capacity, Operational Capacity, and Maximum Demand



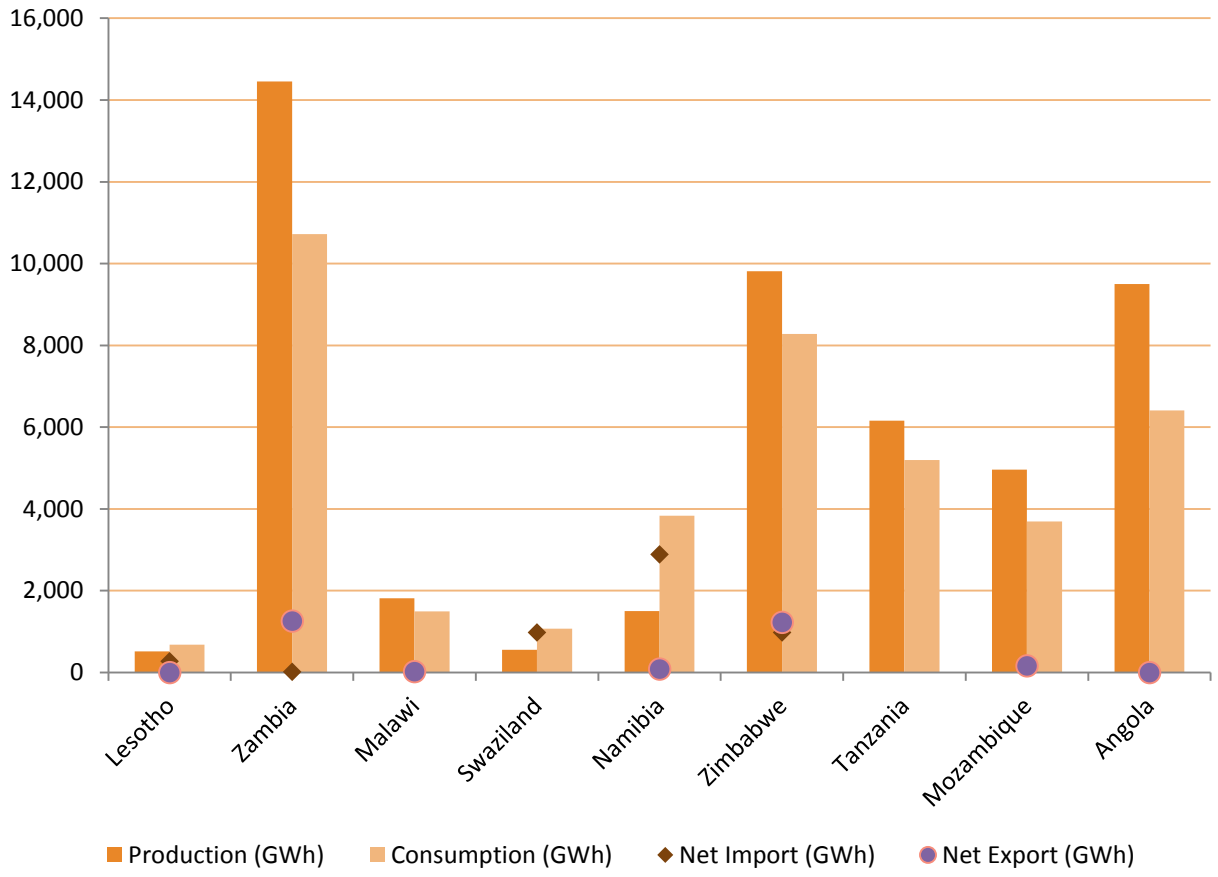
Source: RERA Database 2014

Figure 4-7 shows that the reserve margins in the region continue to be strained. When compared to the NERC reference benchmark figure of 15% of available capacity, Angola is the only country that has sufficient reserve margins. Our experience from the ground, however, informs us that there is not enough available capacity in Angola to meet current demand. As such, we emphasize that it is difficult to accurately gauge the true need for power in the region when latent and suppressed demand is so common a characteristic of the industry. The increasing presence of planned load shedding, blackouts, and brownouts across several countries, including South Africa, Zimbabwe, and Zambia, further underscores why SADC utilities have made it imperative that they secure investment capital for new generation capacity across the region. As of the publication date, Eskom and ZESCO were publishing schedules for "high probability" and "medium probability" load shedding days by region and locality. These events became more common in 2015, increasing to 10-15 days/month during certain times of the year.

Energy Generated and Energy Sold

The SADC regulators submitted data on power generated, exported, imported, and consumed in 2014 as depicted in Figure 4-8 below. South Africa is excluded in the graph as the South African regulator did not provide data on energy generation and energy sold.

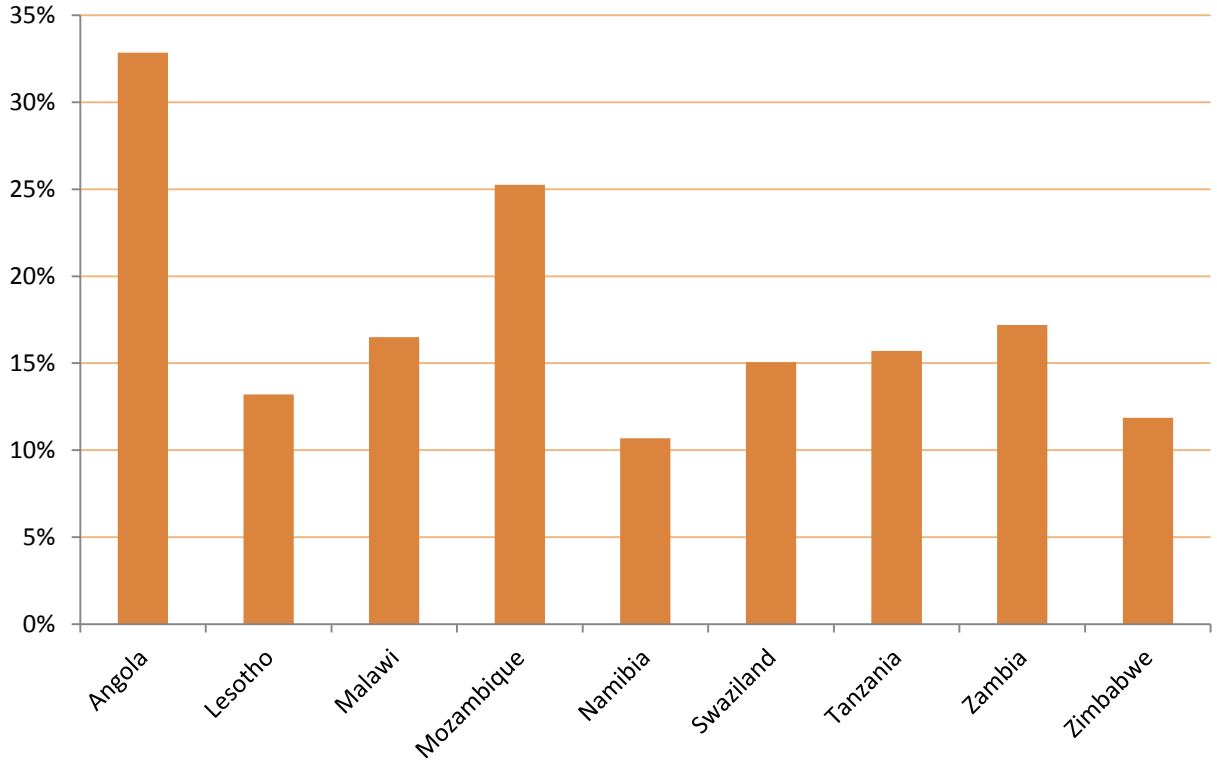
Figure 4-8: Energy Generated and Energy Sold in the SADC Region



Source: RERA Database 2014

The difference between the sums of energy generated plus energy imported less the sum of energy consumed and exports is attributed to energy losses. Figure 4-9 below shows the energy losses in each of the countries that submitted data. This 2014 Tariff Report defines energy losses as the aggregate commercial and technical energy lost during generation, transmission, and distribution of electricity, including plant and unaccounted for use. Again, the South Africa regulator did not provide data on the magnitude of energy losses in the country.

Figure 4-9: Energy Losses in SADC Countries



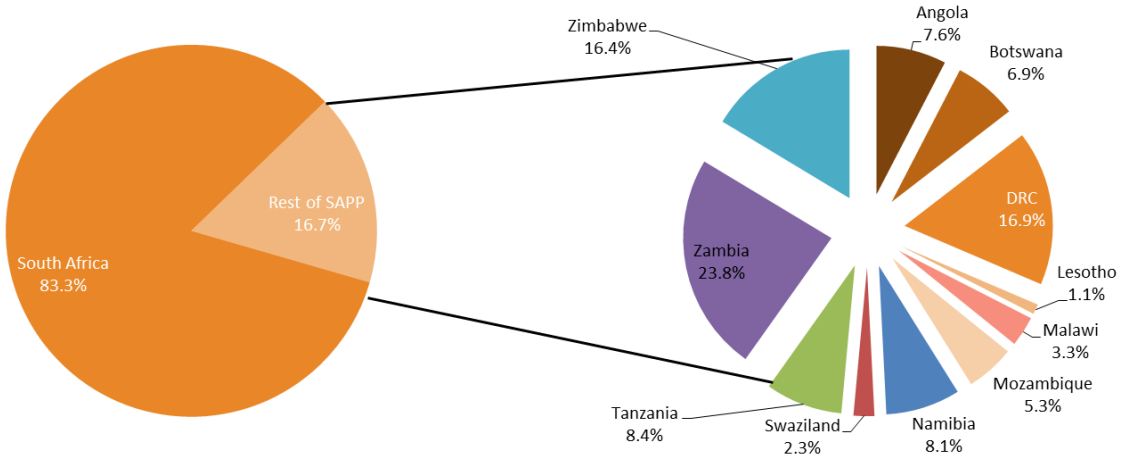
Source: RERA Database 2014

Energy losses varied between about 10% and 34% in 2014. As shown above, Angola had the highest losses of approximately 34%, followed by Mozambique at 25%. On the lower end, Namibia had the lowest energy losses at 11%, followed by Zimbabwe at 12%. As indicated earlier, these levels of losses underscore the need to quickly increase collections and better manage technical and non-technical losses, as well as introduce cost reflectivity.

Energy Sales – Country Breakdown

The SADC electricity market continued to be dominated by South Africa, which accounted for 83% of total electricity sales in 2014. The remaining 17% was shared among the other countries of the region as depicted in Figure 4-10 below.

Figure 4-10: Proportion of Energy Sold in the SADC Region (2014)



Source: RERA Database 2014

4.2. Distribution Systems and Losses

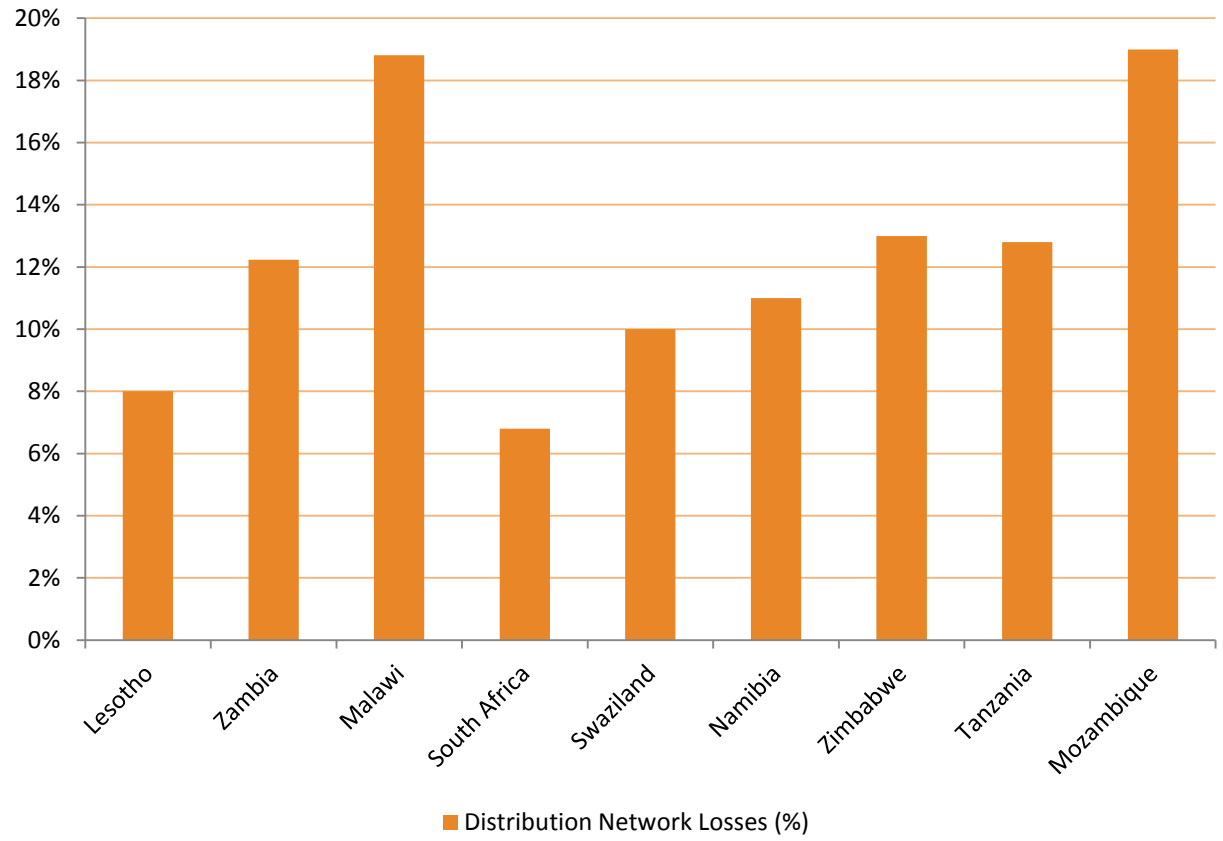
As electricity travels through transmission and distribution lines, a proportion of the energy is lost as heat due to the resistance of the wires. Generally speaking, greater distances traveled and lower voltages of transmission or distribution lines will lead to higher energy losses.

One factor contributing to higher distribution system losses throughout the SADC region is the haphazard growth of sub-transmission and distribution lines to connect new areas as well as large rural electrification through long distance distribution lines. Other reasons for technical distribution losses include:

- Inadequate size of conductors of distribution lines;
- Installation of distribution transformers away from load centers;
- Low power factor of primary and secondary distribution systems;
- Bad workmanship during the installation of distribution assets;
- Transformer sizing and selection;
- Leaking and loss of power;
- Over loading of lines;
- Abnormal operating conditions at which power and distribution transformers are operated;
- Low voltages at consumer terminals causing higher drawl of currents by inductive loads; and
- Poor quality of equipment used in agricultural pumping in rural areas, cooler air-conditioners and industrial loads in urban areas.

Figure 4-11 below shows the distribution network losses in each of the countries. The figures depict the combined technical and non-technical distribution losses. Mozambique and Malawi have the highest distribution losses coming in at 19.0% and 18.8% respectively. Zimbabwe comes in third at 13%.

Figure 4-11: Distribution Network Losses



Source: RERA Database 2014

Tariff Methodology Treatment of Losses and Bad Debts

Throughout the region, regulations generally do not allow 100% pass-through of technical and commercial losses to customers through the tariff rate. This reflects a belief among various regulators that utilities should have incentives through the tariff to reduce losses over time (especially commercial losses) and that certain levels of losses can be directly managed and controlled by the distribution utility. For example, the tariff methodologies for Namibia and Tanzania include losses caps to incentivize utilities towards improved performance. Zimbabwe allows for pass-through based on international benchmarking standards of 3% for technical losses and 9% for commercial losses.

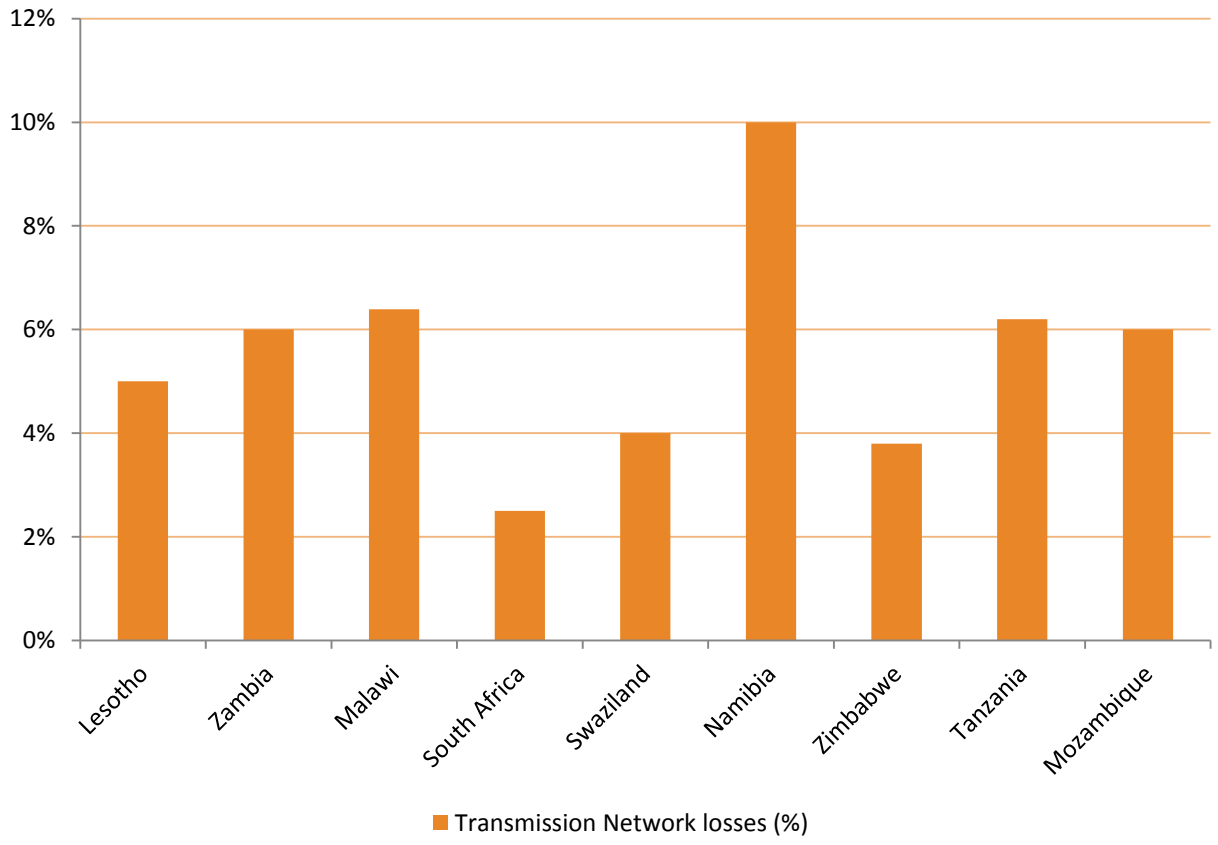
Tariff methodologies also do not generally allow for 100% pass through of any cash shortfalls or bad debts by distribution utilities to tariff customers. In Malawi, an assessment is made at the end of the utility's fiscal year to determine whether or not the utility over or under collected the planned/approved revenue target. If there is a shortfall in cash collections, the regulator compensates the utility by an upward tariff adjustment depending upon the magnitude of the under-collection. In Namibia, bad debts are capped at 1.25% of the revenue requirement in the 2014 tariff methodology. During tariff determination in Tanzania, the utility is given a target for cash collection. The utility must meet the target, or it will be losing revenues given the price cap mechanism in use.

4.3. Transmission Systems and Losses

The transmission of electricity from generation points to load centers over long distances creates power losses. A major part of the energy losses comes from the joule effect in transformers and power lines and manifests as heat lost in the conductors. Transmission losses typically range from 4% to 8%, but they can be higher due to a multitude of reasons, including poor systems management, inadequate investment in transmission, and poorly planned or haphazard growth of transmission subsystems and other power delivery infrastructure.

In the SADC region, transmission losses are strongly influenced by network length from generation points, energy intensity, loading of the network, as well as the age and condition of the power delivery system. According to data submitted, as shown in Figure 4-12 below, the highest transmission losses in 2014 were reported by Namibia, at around 10%, followed by Malawi at approximately 6%. At the lower end of losses, Lesotho, South Africa, Swaziland, and Zimbabwe reported transmission losses of between 2% and 5%.

Figure 4-12: Transmission Losses in the SADC Region (2014)



Source: RERA Database 2014

The transmission sector in the SADC region continues to evolve in a direction that has greater potential to cater to the regional nature of the power in the region. Five countries (Mozambique, Namibia, South Africa, Tanzania, and Zambia) have a transmission grid code in force. Four of these countries have a transmission grid code that has been approved by the regulator, with Mozambique indicating that while they have a

transmission grid code in force, it was not approved by the national regulator. One other country, Zimbabwe, does not have a transmission grid in force, but they have a transmission grid code that has been approved by the regulator.

Transmission Infrastructure

South Africa has the longest high voltage transmission network in the region. This is followed by Namibia and then Zambia. In terms of medium voltage networks, only four out of the ten respondents provided information, although we are aware that medium voltage lines exist across the region. If Southern Africa is to migrate towards cost reflectivity, it is essential that power sector players be fully aware of the extent of their networks which assists in the determination of tariffs for the transmission sector. Only three countries (Zimbabwe, Tanzania, and Mozambique) reported having high voltage transmission lines under construction, with only one country (Zimbabwe) providing information on the length of medium voltage lines under construction.

Transmission Tariffs

Separate transmission tariffs do exist in the region, albeit a small number of countries. In the 2014 RERA survey, respondents were asked whether separate transmission tariffs existed in their countries. Of the ten countries, only two (Namibia and Tanzania) responded in the affirmative, with the remainder responding negatively. It is worth pointing out, though, that most of countries are still dominated by a vertically integrated utility and as such, while the transmission tariff might be calculated and determined internally, it is not published for outside parties. For example, the Electricity and Water Utilities Regulatory Authority (EWURA) in Tanzania conducted a cost of service study in 2013 that itemized tariffs for each of the ESI segments (generation, transmission, and distribution). However, given that the Tanzanian electricity utility (TANESCO) is vertically integrated, these tariffs are not published for the public.

Similarly, in South Africa, the transmission tariff is not separated out, but is included in the MegaFlex Tariff. The South African utility (Eskom) is still vertically integrated and as such does not break out the tariffs for each of the ESI segments. However, for third parties, such as generators, seeking access to the Eskom system, a transmission tariff exists and is publically available.

In Namibia, transmission tariffs are uniform throughout the country, but have time of use components that vary according to voltage levels. Similarly, in Tanzania transmission tariffs in general are also uniform throughout the country, but vary according to voltage levels. There are high voltage customers (such as mines) and medium voltage customers (such as industrial customers). However, they do not have a time of use component.

Separation of Transmission Functions

While the region has made significant strides in reforming the power sector, progress in the transmission sub-sector has lagged behind the larger sector. The function of the Transmission System Operator (TSO) has not been separated from the function of the transmission licensee in any of the countries that provided data on the status of transmission functions. However, while the functions are still combined in Lesotho, the new approved energy policy clearly defines the roles and responsibilities between transmission system operators and transmission licensees. This new energy policy on official separation of transmission functions, however, is yet to be enacted.

In Swaziland, the transmission licensee has recently been designated as the system operator as well. In Tanzania, the national utility, TANESCO, owns and controls both the transmission network and the grid control center that operates as the TSO. However, the Electricity Industry Reform Strategy and Roadmap of 2014 mandates the regulator with the task of designating a TSO. The regulator has since procured services from consultants to map out the process of creating and empowering a TSO.

Connection to the Transmission System

Connection charges are typically used to charge transmission system users for the physical connection to the network. Generally, there are two alternative approaches to setting such charges; (1) shallow connection charges, where the connection charges are based on recovering the costs related to the physical connection between the connected party and typically the nearest network connection point, and (2) deep connection charges, where the connection charges are based on a combination of shallow connection charges and any costs related to any additional network reinforcements required to support the load of the connected party. The Southern Africa region uses both these approaches in determining connection charges for connected parties.

Three countries - Malawi, Namibia, and Swaziland - use a combination of both deep connection and shallow connection approaches in determining connection charges to the transmission network. Moreover, Swaziland and Namibia use a combination of shallow and deep connection charges, but, the respondents did not provide information on how they determine when to use one approach over the other. Lesotho and Tanzania use shallow connection approaches while Zimbabwe utilizes deep connection approaches in determining connection charges. South Africa indicated that they do not have an approach they use to determine connection charges.

Transmission Services Cost Structure

In most of the SADC countries, average infrastructure costs, which include the combination of both capital and operational charges best describe the transmission services cost structure. In the remainder of the countries, national utilities remain vertically integrated and do not disclose transmission cost structures. Table 4-2 below shows the transmission services cost structure that best describes each of the countries.

Table 4-2: Transmission Services Cost Structure

Country	Avg. Infrastructure Cost	Not Disclosed
Angola	✓	
Botswana	✓	
DRC		✓
Lesotho	✓	
Madagascar		✓
Malawi	✓	
Mauritius		✓
Mozambique	✓	
Namibia	✓	
RSA	✓	

Country	Avg. Infrastructure Cost	Not Disclosed
Seychelles		✓
Swaziland	✓	
Tanzania	✓	
Zambia	✓	
Zimbabwe		✓
Total	**10**	**5**

Transmission Charge Structure

The structure and application of individual components of transmission charges are typically used to meet principal objectives in the tariff methodology. While there are many components to transmission charges, the survey to the 2014 Tariff report specifically enquired whether transmission charges were based on use of network charges and connection charges. One country (Malawi) indicated that there is no transmission charge structure. Three countries (Angola, Namibia, and Zimbabwe) indicated that their transmission charge structures were based on use of network charges and connection charges. Three other countries (Mozambique, South Africa, and Tanzania) indicated that their transmission charge structures were not based on use of network charges and connection charges. Tanzania, in particular, indicated that connection charges were treated as customer-related charges and were dealt with on a customer by customer basis depending on the point of connection and the distance from the network.

Three countries in the region indicated that there are other fees and charges imposed not directly related to transmission costs. In Zimbabwe, there is a universal access fee that is burdened into the transmission services cost structure. In Mozambique, there is a public interest contribution to renewable energy that is added on to the transmission services cost structure. Finally, in Angola, a universal access fee is also added and burdened into the transmission services cost structure. Table 4-3 below depicts the responses provided by each of the countries. In cases where both columns are blank, the country did not provide a response.

Table 4-3: Transmission Charge Structure

Country	Transmission Charge Based on use of network charge and connection charge?	
	Yes	No
Angola	✓	
Botswana		
DRC		
Lesotho		✓
Madagascar		
Malawi		
Mauritius		
Mozambique		✓
Namibia	✓	
RSA		✓

Country	Transmission Charge Based on use of network charge and connection charge?	
	Yes	No
Seychelles		
Swaziland		✓
Tanzania		✓
Zambia		
Zimbabwe	✓	
Total	**3**	**3**

Ancillary Services Tariffs

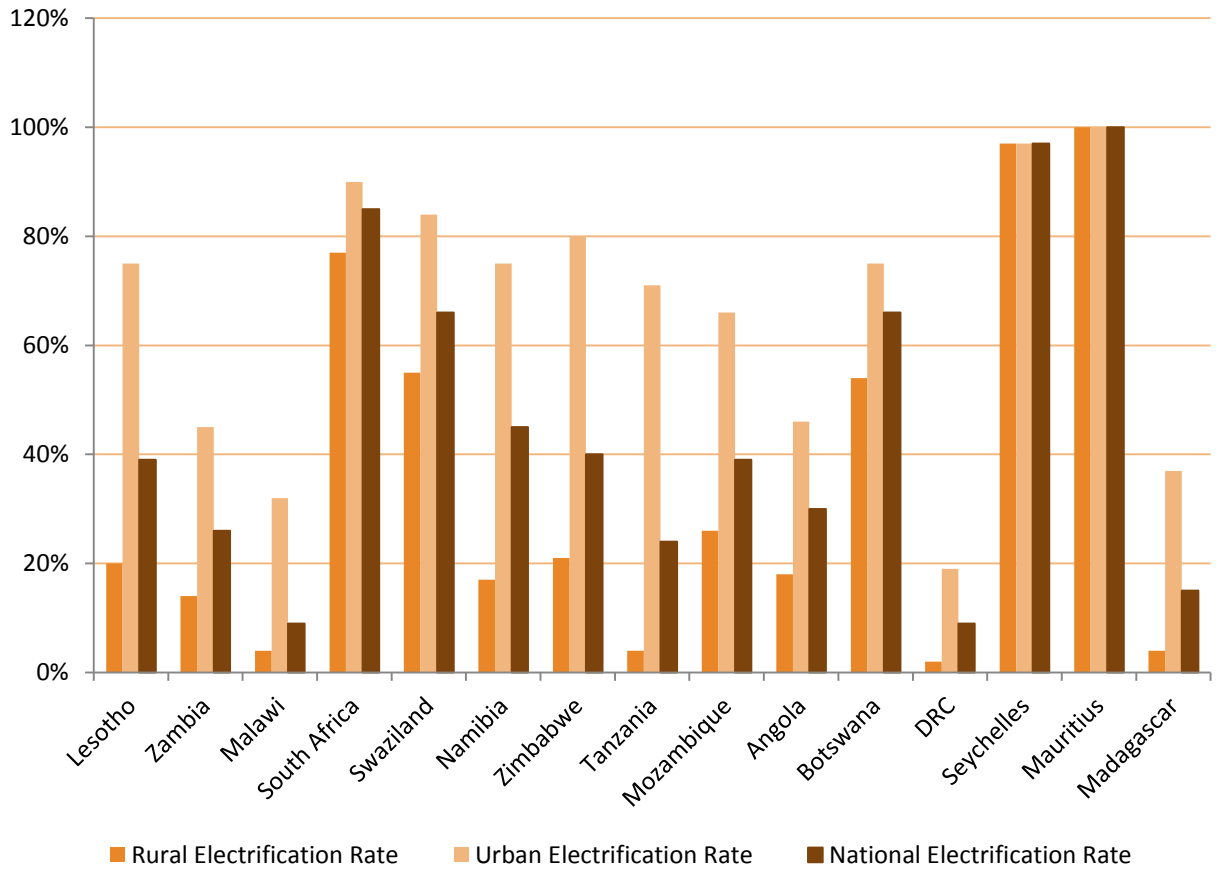
Ancillary Services are services necessary to support the transmission of capacity and energy from generation resources to consumers, while maintaining the reliable operation of the transmission system. These services include regulation and operating reserve, energy imbalance, and the cost-based services of scheduling, system control and dispatch, voltage control, and black start.

In the 2014 RERA Survey, respondents were queried on whether distinct ancillary services tariffs exist in their countries. All ten respondents indicated that distinct ancillary services do not exist in their countries.

4.4. Electricity Access Rate

Figure 4-13 below shows the proportion of the population with access to electricity (electrification rates) in each of the SADC countries in 2013. National electrification rates still vary significantly among countries in the region, with Mauritius being fully electrified and the Seychelles being very close to fully electrified. In contrast, Malawi and the DRC have the lowest national electrification rate at around 9%. While some countries have reasonably high electrification rates in urban areas, most are still below 80%, representing a major opportunity for providers to extend electricity services. Rural electrification rates in most SADC countries runs well below 25%; the lowest level is observed in the DRC, where only 2% of rural population has access to electricity. This is followed by Madagascar, Malawi, and Tanzania with 4% rural electrification rates. Given the vast distances in these countries from rural villages and communities to existing transmission networks, countries with low access levels should encourage off–grid energy development to minimize the investment requirement for extending transmission systems into lowly populated or isolated communities.

Figure 4-13: Electricity Access in Southern Africa (2014)



Source: RERA Database (2014)

4.5. Key Performance Indicators

With the ongoing shortfalls in electricity supply, it is very important to monitor the performance of operating companies in each of the countries. This monitoring should be to ensure that resources are efficiently used in the generation of electricity.

The adoption of Key Performance Indicators (KPIs) will drive the measurement and analysis of metrics that are important to various stakeholders. If an ESI is viewed as a complete system, with subsystems, the stakeholders that are affected by all the sub-systems will need to be reviewed and analyzed. Broadly speaking, some of the KPIs that are relevant to electricity utilities include:

- Financial performance;
- Customer service and quality;
- Operational cost and management;
- Energy efficiency and demand side management;
- Sustainability;
- Operational performance; and
- Workforce.

In determining the use of KPIs in the region, the following questions were asked of all the regulators in the region:

1. Does the regulator use KPIs in regulating service quality?
2. Does the regulator use benchmarking against KPIs to measure progress?
3. How long has the process been in existence?
4. Is the KPI developing process collaborative with the utility or is it regulator mandated?
5. Is there a process for KPI revision?
6. How often has it been used?

The responses to the questionnaire are displayed in Table 4-4 below. Where appropriate, a check mark indicates a response in the affirmative, an "x" indicates a response in the negative and a dash indicates no response was given.

Table 4-4: Use of KPIs in the SADC Region

Country	KPI Use	Benchmarking	Duration	Collaborative /Mandated	KPI Revision Process	KPI Used in Past?
Angola	--	--	--	--	--	--
Botswana	--	--	--	--	--	--
DRC	--	--	--	--	--	--
Lesotho	×	×	--	--	--	--
Madagascar	--	--	--	--	--	--
Malawi	✓	✓	6 years	Collaborative	×	--
Mauritius	--	--	--	--	--	--
Mozambique	×	×	--	--	--	--
Namibia	✓	✓	8 years	Collaborative	✓	Once
RSA	✓	×	10 years	Collaborative	✓	--
Seychelles	--	--	--	--	--	--
Swaziland	✓	×	3 months	Collaborative	✓	--
Tanzania	✓	✓	7 years	Collaborative	✓	--
Zambia	✓	✓	5 years	Collaborative	✓	Once
Zimbabwe	×	✓	--	Collaborative	--	--

Source: RERA Database 2014

Less than half the SADC countries used KPIs in regulating service quality. Of the six that use KPIs in regulating service quality, five use benchmarking against KPIs to measure progress. While some countries have had KPI process for 10 years, such as South Africa, some countries like Zimbabwe haven't had an approved KPI framework at all but the KPI system is used for benchmarking purposes, and some countries have only recently adopted KPIs, such as Swaziland.

Of the countries that have KPIs, all of them indicated that the KPI development process is collaborative. As such, none of them have KPIs that are regulator mandated.

In almost all the countries, KPIs cover technical aspects of utility service. The majority of the countries that utilize KPIs cover technical, customer service, and financial aspects of the utility service. Only Swaziland indicated they use KPIs in cross border issues.

4.6. Renewable Energy

Renewable energy technologies have the potential to contribute significantly to the generation capacity of the Southern African region, given the tremendous potential for solar, wind, biomass, and additional hydropower development. Several countries including Namibia, Botswana, and South Africa have solar insolation measurements that rank among the most attractive in the world. Regional hydropower projects, linked to the Congo and Zambezi River areas, have the potential to address Southern Africa's generation shortages for the coming decades. The success of the REIPPP program in South Africa and the potential off-grid application of renewable technologies have stimulated greater interest in renewable energy project generation across most countries in the region. To gauge the adoption of renewable energy technologies and evaluate the extent of the enabling environment for related IPP projects, regulators in the region were asked the following questions:

1. Does your country have a renewable energy policy?
2. Does your country have renewable energy legislation?
3. Do you have separate tariffs for renewable energy?
4. Are renewable energy feed in tariffs authorized by existing legislation?
5. Do specific renewable energy feed in tariffs by technology exist for producers of renewable energy?

The responses to the questionnaire are displayed in Table 4-5 below, with explanations to follow.

Table 4-5: Renewable Energy in SADC

Country	Renewable Energy Policy?	Renewable Energy Legislation?	Separate Renewable Energy Tariffs?	REFITs Authorized by Legislation?	Specific REFITs by Technology Type?
Angola	✓	×	×	×	×
Lesotho	×	×	×	✓	×
Malawi	✓	×	✓	×	✓
Mozambique	✓	✓	✓	✓	✓
Namibia	×	×	×	×	×
RSA	✓	×	×	×	×
South Africa	✓	×	×	×	×
Swaziland	×	×	×	×	×
Tanzania	×	×	✓	✓	✓
Zambia	×	×	×	×	×
Zimbabwe	×	×	×	×	×

Total	**5**	**1**	**3**	**3**	**3**

Source: RERA Database 2014

As can be seen in Table 4-5 above, countries in the SADC region are still in the initial stages of developing the enabling environment and policy framework to foster renewable energy project development. While 5 of the 11 responding countries have national renewable energy policies, only 1 country had renewable energy legislation. Only Mozambique has both a renewable energy policy and renewable energy legislation. Three countries had separate tariffs for renewable energy and another three had feed in tariffs. Four countries (Lesotho, Malawi, Mozambique and Tanzania) are developing REFITs as an incentive to stimulate IPP projects using renewable technologies. Individualized tariffs based on technology type are in early stages of adoption by legislation and are primarily focused on solar and wind technologies.

South Africa and Tanzania are the only countries in the region that have a wide mix of existing renewable energy generation facilities. Contributing factors in Tanzania may include that country's active solar and small hydro development initiatives through the Rural Electrification Agency and the acceptance of REFITs through approved the framework. In South Africa, the success of the renewable energy procurement program has catalyzed IPP development of renewable projects. Table 4-6 below shows the types of renewable assets available in each country.

Table 4-6: Existing Renewable Energy Generation Plants by Technology

Country	Wind Power	Solar PV	Solar Thermal	Biomass
Angola	✓			✓
Lesotho		✓		
Malawi		✓		✓
Mozambique				
Namibia		✓		
RSA	✓	✓	✓	✓
Swaziland				✓
Tanzania	✓	✓		✓
Zambia		✓		
Zimbabwe				✓

Source: RERA Database 2014

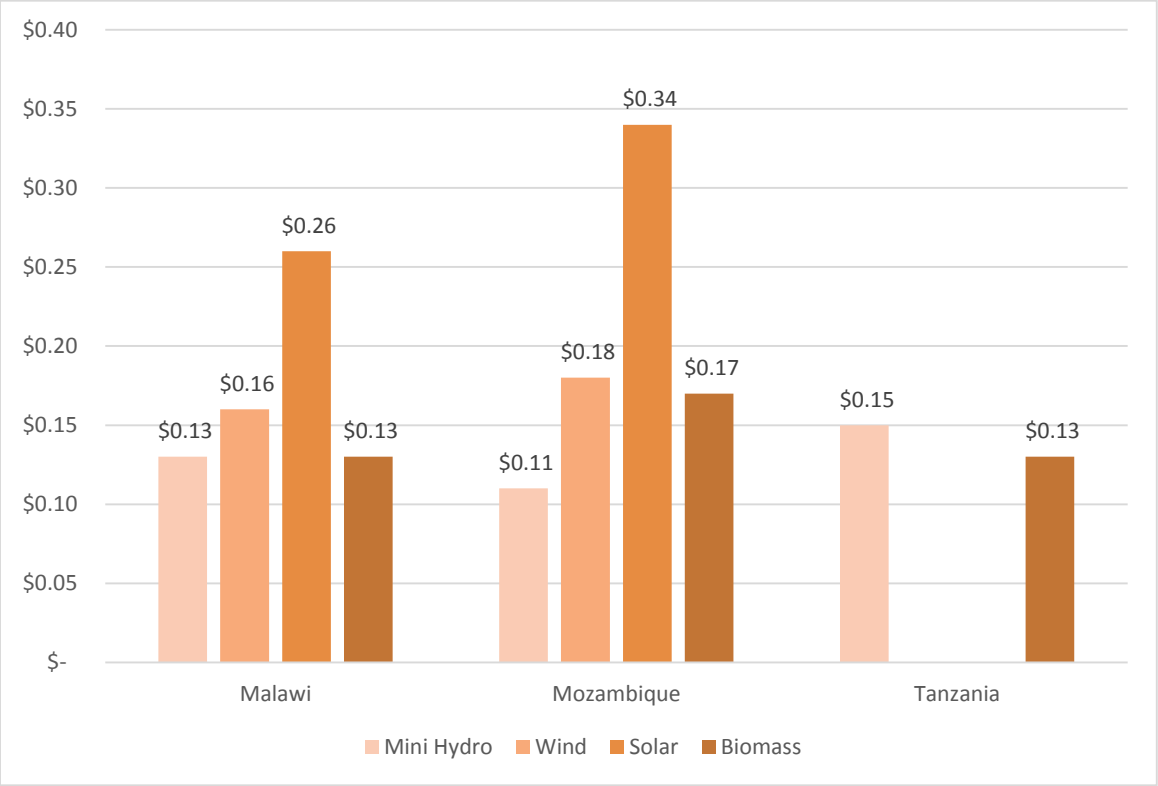
Renewable Energy Tariffs

Different forms of REFITs have been approved by regulators in three countries across the region. Tanzania's regulator has approved REFITs for biomass and small hydro projects between 100 KW and 10 MW, with REFITs for other fuel sources under development. The first generation of REFITs is based on avoided cost of the distribution network operator and the second generation is technology specific tariffs for biomass and hydro plants. Solar and wind project REFITs will be based on competitive tendering principles and are still in development. Tanzania's REFIT policy also sets different price mechanisms for small hydro projects based on seasonality. Using the avoided cost of distribution mechanism, small hydro tariffs for the year 2014 ranged from USD 0.12/kWh (in wet season) to USD 0.15/kWh (in dry season) for grid connected

small power projects and US 0.30/kWh for mini grid connected small power projects. Second generation REFITs for small hydro and biomass projects became active in April 2015.

Figure 4-14 below shows the REFITs for Malawi, Mozambique, and Tanzania as explained above. Specific REFIT tariff data was provided by country regulators. The highest provided tariff is the solar REFIT in Mozambique which converts to USD 0.34 per kWh at 2014 exchange rates. This was followed by Solar PV in Malawi, at USD 0.26 per kWh. Note that Tanzania does not have prescribed Solar and Wind REFITs, as detailed in the preceding paragraph.

Figure 4-14: REFITs in Malawi, Mozambique and Tanzania



4.7. Cross Border Trade of Electricity

Cross border power trade is one of the cornerstones of the SAPP. Nine of the fifteen SADC members are interconnected and can hence trade among each other. Three SADC member countries - Angola, Malawi, and Tanzania- are not yet interconnected and can therefore not trade regionally. In the 2014 Tariff Report Survey, we asked regulators to provide detailed information on the transmission networks. The results of the survey are shown in Table 4-7 below.

Table 4-7: Cross Border Electricity Trade

Country	Rated Levels of National Networks (kV)	Methodology Used in the Allocation of Cross-border Capacity
Angola	60, 110, 132, 150, 220, and 400	
Botswana	--	
DRC	--	
Lesotho	11, 22, 33, 66, 88,and 132	Firm and Non-firm.
Madagascar	--	
Malawi	11, 66, and 132	
Mauritius	--	
Mozambique	--	
Namibia	11, 132, 220, 350, and 400	Same as SAPP, bilateral agreements
RSA	400 and 765	Same as SAPP, bilateral agreements
Seychelles	--	
Swaziland	66, 132, and 400	Firm, Day Ahead Market
Tanzania	400	
Zambia	11,33,66,88,132,220, and 330	Bilateral contracts, SAPP Day Ahead Market bids depending on availability of power
Zimbabwe	110, 220, 330, and 420	Firm, Non-firm, OTC contracts, Day Ahead Market, and Inadvertent settlement in kind.

Source: RERA Database 2014

The survey responses indicate that four countries (South Africa, Namibia, Zambia and Zimbabwe) have the same structure of charges as those put in place by SAPP. Additionally, in the allocation of cross—border capacity, the same four countries indicated that they follow and abide by the same methodologies as those put forward by SAPP.

In allocating cross border capacity, only six respondents provided information on the methodologies utilized to allocate cross border capacity. Namibia indicated they utilize the same methodology put in place by SAPP and is based on bilateral agreements. Zimbabwe, on the other hand, prioritizes the capacity according to the contracts held. Firm contracts, non-firm contracts and over the counter contracts are prioritized in decreasing order of priority. These are then followed by day ahead markets, and finally inadvertent settlement in kind. Zambia also indicated that they utilize the same methodology as put in place by SAPP Day Ahead Market bids, depending on availability of power as well as through bilateral contracts.

4.8. Transparency and Public Participation

Transparency and public participation represent two features of the KPI setting process that can enhance KPI quality and legitimacy. Transparency refers to public access to information held by the responsible governmental agency such as power ministries and regulators, as well as information about their decision making. Public participation encompasses varied opportunities for citizens, nongovernmental organizations, businesses, and others outside of governmental agencies to contribute to and comment on proposed KPIs. Both transparency and public participation can promote democratic legitimacy by strengthening the

connections between government agencies and the public they serve. Both can also help improve the quality of KPI development. Transparency helps ensure meaningful and informed stakeholder participation, and meaningful and informed stakeholder inform KPI development.

In the SADC region, the need for transparency and public participation in the KPI setting and monitoring process is taken into account through a variety of means. In Malawi and Zambia, the setting of KPIs is conducted by and mutually agreed between the regulator and the utility. Quarterly reports on KPIs are shared with the public through the customer and consumer forums as well as through publication of the same in the print media. In Tanzania, all stakeholder are consulted during the inquiry process. Public hearings are held, which afford all stakeholders the opportunity to air their views on the reasonableness of the tariff application.

The results of the monitoring and reporting are published through a variety of mediums. While no country indicated no results were made available to the public, several indicated that some of the results are published to the government ministries responsible for the power sectors, which are not made public. In Malawi and South Africa, the results are also published in the media. Finally, in Zambia and Namibia, the results are published in the annual reports for the regulators as well as in the energy sector report.

4.9. Quality of Service Indicators

Improving the quality of electricity services provided by the region's utilities to their customers is an important objective for RERA and its members. In several countries, the regulators utilize KPIs to monitor service quality and use benchmarking against the KPIs to measure improvements over time. Table 4-8 below provides further detail on the use of KPI's by RERA member regulators.

Table 4-8: KPI Use by RERA Member Regulators

Country	KPI's in Use	Legal Framework for KPIs	Process for Revision
Angola	×		
Lesotho	×		
Malawi	✓	Rules of the Regulator	No
Mozambique	×		
Namibia	✓	Regulatory Tool	Yes
RSA	✓	Legislation	Yes
Swaziland	✓	Both Legislation and Licenses	Yes
Tanzania	✓	Licenses, Rules and Regulatory Orders	Yes
Zambia	✓	Regulatory Tool	Yes
Zimbabwe	✓	No	No
Total	7		5

Source: RERA Database 2014

The regulators in Malawi, Namibia, South Africa, Swaziland, Tanzania, and Zambia are all using KPIs in their periodic or ongoing reviews of service quality. Five of these regulators have utilized KPIs for the past 5-10 years. Swaziland's regulator initiated the use of KPIs to track service quality during 2014. The process of using KPIs is collaborative between regulators and utilities. However, the legal framework for using KPIs varies by country (as shown above) and is directed through a combination of legislation, licenses, and regulatory rules. Regulators also have processes established for KPI revisions, when needed. Namibia and Tanzania conduct stakeholder consultations during prescribed tariff determination, and all stakeholders, especially the utility, are given an opportunity to comment on the reality and implementation of the KPIs. In Swaziland, baseline figures are included in the license and performance against KPIs monitored on a quarterly basis and reviewed as and when KPI's achieved. South Africa also allows for revisions during each periodic tariff review. In most countries, utilities submit KPI indicators to the regulator on a quarterly basis. In South Africa, Eskom submits indicators to the regulator on a semi-annual basis.

KPIs are used by regulators across the region to measure and monitor performance across a range of different categories. Most regulators track just a handful of key indicators (5-6), although the South African regulator monitors 17 distinct indicators. Table 4-9 below illustrates the different aspects of utility services coverage that are monitored through KPIs:

Table 4-9: Aspects of Utility Services Monitored through KPIs

Country	Technical	Customer Service	Financial	Cross Border Issues	Economic	Illustrative KPIs monitored
Malawi	✓	✓	✓			• Cash and Revenue Management • Quality of Service and Supply • System Loses • Customer Service and Responses Time • Staff Productivity
Namibia	✓	✓	✓			
RSA	✓					• System Average Interruption Frequency Index (SAIFI) • System Average Interruption Duration Index (SAIDI) • Distribution Supply Loss Index (DSLI) • Line Fault/km • Major Events System Minutes <1
Swaziland	✓	✓	✓	✓	✓	• Unit trips • Forced outage rate • Planned outage rate • Availability factor • Lost time injury duration • SAIDI and SAIFI • Unbilled energy losses • Revenue collection losses
Tanzania	✓	✓	✓			• Revenue Collection

Country	Technical	Customer Service	Financial	Cross Border Issues	Economic	Illustrative KPIs monitored
						• Quality of Service and Supply • System Loses • Customer Service and Responses Time • Staff
Zambia	✓	✓	✓			• Customer Metering • Cash Management • Productivity • Quality of Service (SAIDI, SAIFI, CAIDI, ASAI) • System Losses • Unity Capability Factor • Safety • Customer Complaints

Source: RERA Database 2014

Malawi and Zambia indicated that KPIs may need revising, given changes in market circumstances and performance. Other countries reported that their KPIs remain valid and are not likely to be changed in the near future. Transparency in KPI performance reports is also important to regional regulators. In Malawi, setting of the KPIs is done and mutually agreed between the regulator and the utility. Quarterly reports on KPIs are shared with the public through a Customer and Consumer Forum meeting as well publication of the same in the print media. In Tanzania, all key stakeholders are consulted during the inquiry process. Normally, an exit meeting is held thereby giving stakeholders an opportunity to air their comments on the Draft Order (Recommendations to the Board). When setting KPI targets, the stakeholders are involved and an exit meeting is held for each to comment on the targets and on practicality of their achievement. Namibia and South Africa also reported striving for a high degree of stakeholder transparency in the setting and monitoring of KPIs that includes releasing results to the media and publicly reporting to the government. Namibia and Tanzania also allow for KPI application as part of the tariff-setting process, and South Africa imposes financial rewards or penalties as a result of KPI performance during the past year of review.

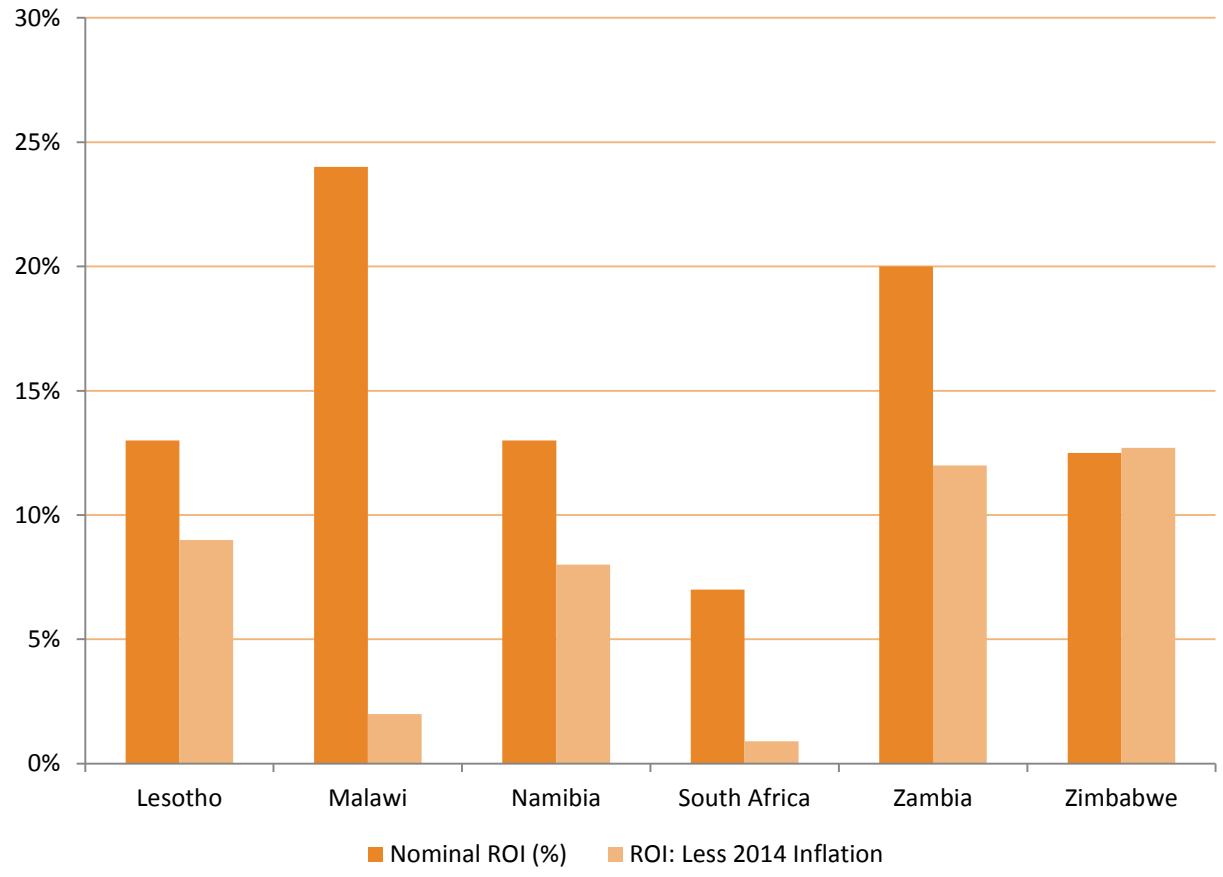
Quality of Service reports in these same six countries are subject to regulatory audit, which occurs at different intervals. Utilities submit quality reports on a regular basis, typically quarterly, which are reviewed by the regulator. Regulatory audits may be regularly scheduled (Malawi, Namibia, and Zambia) or conducted randomly (South Africa and Tanzania). Audits can be triggered by different circumstances, including major accidents or incidents, inconsistencies in KPI reporting by utilities, or from random sampling as part of the normal regulatory audit process. As reported by the regional regulators, the utilities in these six countries are generally graded as "Average" on the accuracy, timeliness, and responsiveness to regulator inquiries in the submission of Quality of Service reports. In Zambia, the utility's performance on the agreed KPIs are used to determine tariffs awarded.

4.10. Other Key Factors in Tariff Setting

Allowed Return on Investment in Regulatory Asset Base

As energy markets across the region migrate towards cost-reflective tariffs, several regulators have implemented specific guidelines and directives in the Regulatory Asset Base (RAB) with regard to allowed Returns on Investment (ROI). These may be expressed as either nominal or real rates of investment in the approved tariff methodology. Seven regulators in the region have approved either nominal or real ROI as part of the 2014 tariff methodology. As shown in Figure 4-15 below, six countries (Lesotho, Malawi, Namibia, South Africa, Zambia, and Zimbabwe) have set nominal ROI rates, which range from 12% to 24% on invested capital). Zimbabwe uses an allowable return on investment of 8.51% for public utilities (Zimbabwe Power Company and Zimbabwe Electricity and Distribution Company), which was set during a cost of service study that was conducted in 2004. However, the Cost of Service study done in 2013 recommended a nominal rate of 8.1% and real rate of 5.7% for public utilities as well as a nominal rate of 12.5% and real rate of 10.1% for private utilities. In South Africa, the determination from the regulator was for nominal rates of up to 7%, however, NERSA has only allowed rates up to 4% thus far.

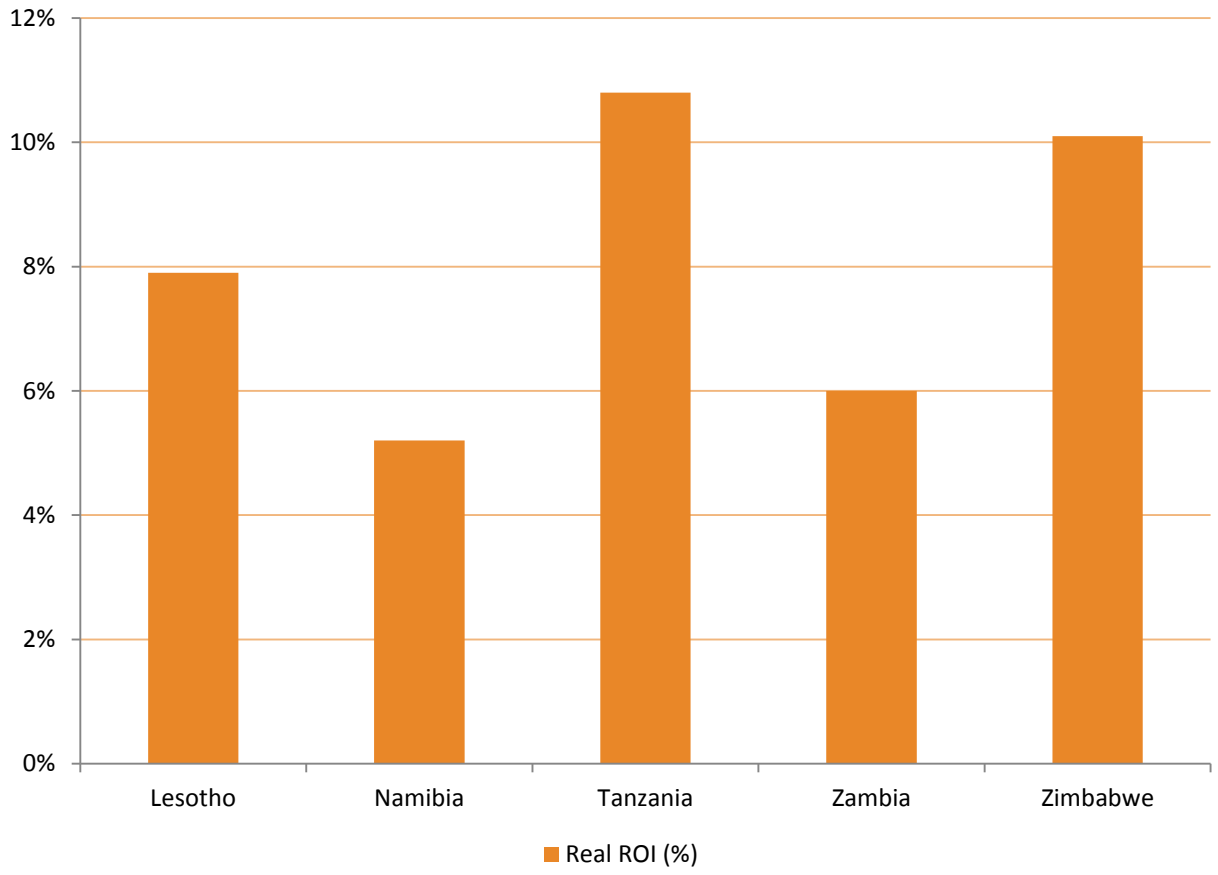
Figure 4-15: Return on Investments



Source: RERA Database 2014; Annual Inflation Rates Sourced from International Monetary Fund

Five regulators have established real ROI rates in the approved tariff methodology for 2014 that adjust for domestic inflation rates. These include three of the countries above that also set nominal ROI indicators. The five countries are Lesotho, Namibia, Tanzania, Zambia, and Zimbabwe, which have real ROIs ranging between 5% and 11%. For Lesotho and Namibia, the differences in the two charts reflect inflation adjustments made during the year in the calculation of real ROI. The actual allowed real ROI rates as prescribed in the 2014 tariff methodology for the five countries are shown below:

Figure 4-16: Real ROI in Select Countries



Source: RERA Database 2014

5.0. Conclusion

RERA Member States continue to make progress towards cost reflective tariffs. While the 2013 deadline set by the SADC Council of Ministers has come and gone, Member States continue to implement sector reform activities that underpin the gradual transition to cost reflectivity. Many Member States deserve recognition for continuing to make politically difficult decisions to implement the tariff revisions necessary in order for domestic utilities to recover a greater share of the costs to service tariff customers. For the 2014 Tariff Report, 8 countries indicated they had effected tariff increases during the year. The tariff increases ranged from 9.5% in Swaziland (effective June 1, 2014), to 39.19% in Tanzania (effective January 1, 2014).

In parallel with the tariff increases, about half of the countries that participated in the 2014 Tariff Report indicated they expected structural changes in their tariff methodologies in 2014 that more accurately accounted for the fixed and variable cost of providing power to tariff customers. These changes are positive for the electricity markets in the region and signal the region's continued focus on reforming the sector. For example, in Zimbabwe, there were tariff structure changes that accommodated the higher-cost generation (mainly renewables) that was expected to come online. In Tanzania, the regulator expects changes in the tariff structure to accommodate periodic adjustments. In Malawi, there were anticipated changes to the tariff structure that facilitated the need to develop a transmission tariff methodology that will be part of the impending unbundling of the domestic utility.

In transitioning to cost reflective tariffs, only four regulators – those in Lesotho, Namibia, South Africa, and Tanzania – felt that the tariffs in their countries were sustainable and sufficient to provide incentives for new investments. Three of the four countries - Namibia, South Africa, and Tanzania - also reported to have tariffs that created incentives for greater energy efficiency. From a forward looking perspective, four regulators – those in Angola, Malawi, Namibia, and Zambia – responded that they had an approved plan in place to sustain or achieve cost-reflective tariffs. For example, Angola has a target to achieve cost-reflective tariffs by 2020, consistent with the goal recently set by the SADC region energy ministers.

Policy makers acknowledge they have additional responsibilities for creating more sustainable enabling environments across SADC that can attract sufficient private investment to meet energy demand requirements. Regional regulators continued to report that political pressure and domestic political considerations in 2014 were among the most significant barriers to achieving cost reflective tariffs, especially with regard to poor customers. While progress has been made to reduce direct government subsidies into domestic energy sectors, additional reforms are needed to further reduce inefficient subsidy payments and to target them more directly to poor customers where needed. Half of the respondents (five regulators), reported that utilities in their countries had received subsidies during 2014 from the government to cover cash flow shortfalls, the same number as in 2012 and 2013. All sector participants including the Southern African governments, the SADC utilities, RERA, and its member regulators, have committed to further efforts to support the transition to cost recovery in tariff structures across the region.

6.0. Annex A: Market Structure

This annex provides a snapshot of each member state's Electricity Supply Industry (ESI) structure, key institutions in the sector, and potential for future generation. ESI charts were prepared by the regulators in each country, with dotted-line separation between regulatory and government oversight institutions and domestic utilities ("Sector Operation"). Where applicable ESI charts designate flows of electricity with solid arrows, both within domestic sectors and to/from other countries in the region. Data for the country snapshots was captured from data banks made publically available by the International Energy Agency (IEA), US Energy Information Administration (EIA), and the World Bank. Additional updated data points were also provided by the regulators. Key themes that emerge from these snapshots are as follows:

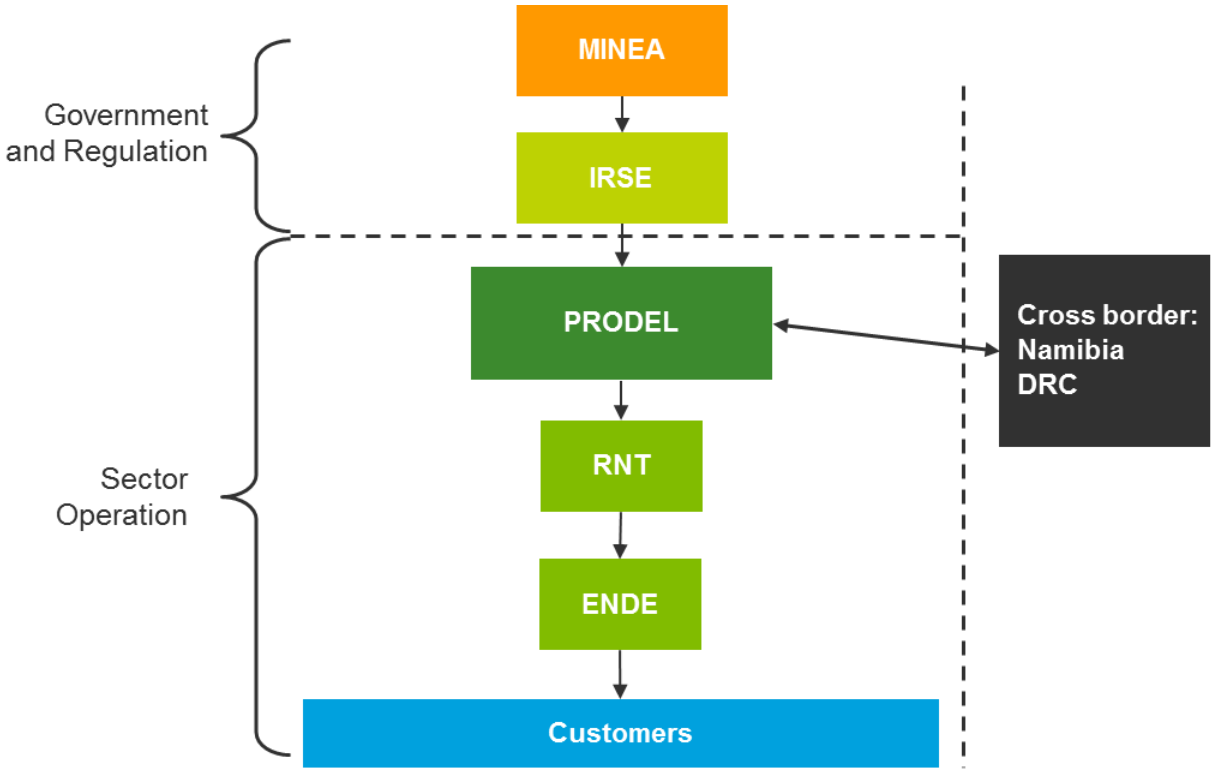
- Nearly all member countries are net importers of electric power, which demonstrates the potential for new generation and a need for further investment in regional transmission capacity;
- Private sector IPPs exist in all but two member countries; and
- The industry model that is used most widely for the region's electricity markets is the single buyer model, followed by vertically integrated state-owned monopolies.

6.1. Angola

General Information (All 2014 data)

Population	24.4 million
Installed Generation Capacity	2,210 MW
Electrical Energy Consumption	6,405 GWh
Electrical Energy Production	9,500 GWh
Hydroelectric	57%
Oil	43%
Import/Export	
Imports	Negligible
Exports	Negligible
Percentage of Population with Grid Connection	30%

Domestic Electricity Supply Industry Structure



Background: At present, the country has a generation capacity of 2,210 MW, consisting mainly of hydropower (57%), with the remainder coming from fossil fuels. Installed capacity is insufficient to meet current demand. The country does not have a national grid, but instead relies on three independent systems that provide electricity to different parts of the country. The government hopes to link the three independent systems as part of a national grid and eventually link up with neighboring SAPP countries. It is estimated that only 30% of Angolans have access to electricity.

Key Players: The Ministry of Energy and Water (MINEA) is responsible for the electricity industry and preparation of regulations in the sector. The Regulatory Institute of the Electrical Sector (IRSE) is the Angolan regulatory authority responsible for regulating the generation, transmission, distribution, and sale of electricity. It has the mandate of regulating the business relationships between agents in the electricity sector, including the specification of tariffs and of revenue transfer models between players in the sector, as well as performing arbitration duties in the sector. The power sector in Angola is still undergoing restructuring and, in November 2014, the government of Angola created new unbundled utility companies with responsibilities for managing the power sector. Under the new structure, power generation responsibilities in the country fall under the auspices of Produção de Electricidade (Prodel), transmission system responsibilities fall under the Rede Nacional de Transporte de Electricidade (RNT), and distribution activities fall under the Empresa Nacional de Distribuição de Electricidade (ENDE).

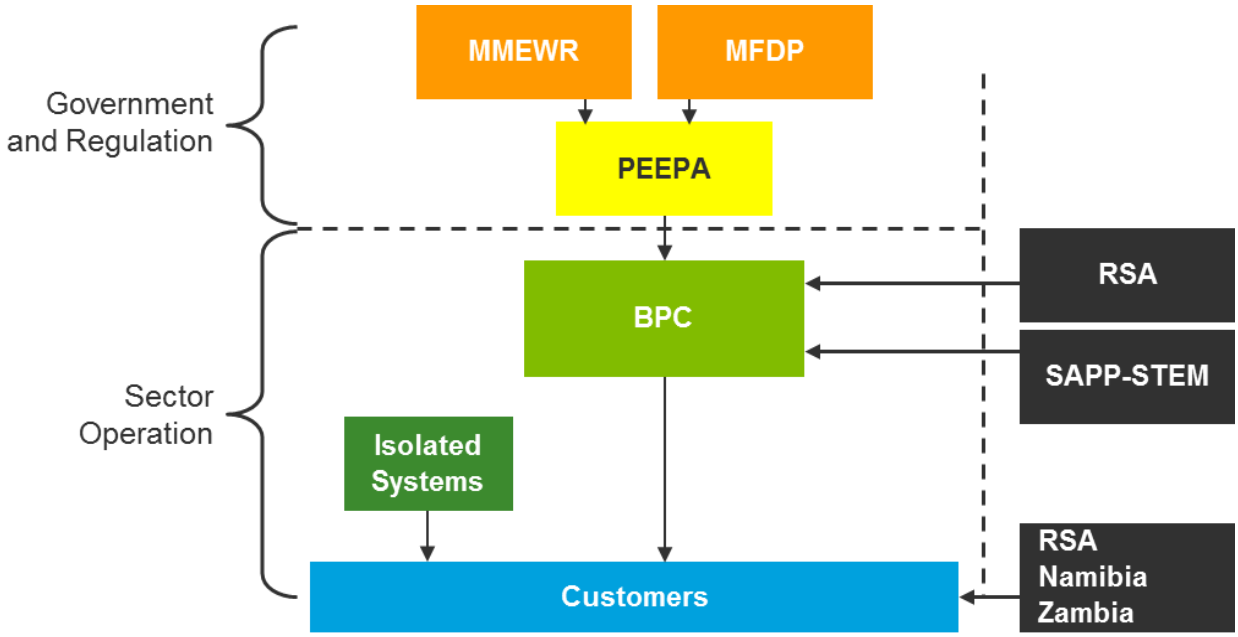
Potential: Some analysts including IEA indicate that Angola's hydropower capacity could be more than 10 times the current installed capacity. As of 2014, the Angolan government has plans to develop five new hydroelectric dams along the Kwanza River, in order to produce an additional 7,000 MW of power. Given Angola's plans to commercialize its natural gas resources, natural gas fueled generation is also likely to become more important.

6.2. Botswana

General Information (Data for Year Cited)

Population	2.1 million
Installed Generation Capacity	892 MW (2014)
Electrical Energy Consumption	3,118 GWh (2014)
Electrical Energy Production	372 GWh (2013)
Coal	87%
Oil	13%
Import/Export	
Imports	1207 GWh (2014)
Exports	Negligible
Percentage of Population with Grid Connection	66% (2014)

Domestic Electricity Supply Industry Structure



Background: Botswana's installed capacity of 892 MW consists almost entirely of thermal generation (mainly coal). Peak power demand is expected to rise from 681 MW in 2014 to 924 MW in 2020. With peak demand currently around 681 MW, and a supply of 392 MW, excluding 200 MW emergency supply from Eskom, Botswana has a power shortfall of around 200 MW.

Key Players: Botswana Power Corporation (BPC) is a state owned, vertically-integrated national utility with a monopoly over the national power sector in the. In 2007, the government amended the energy act to facilitate the participation of independent power producers. There are plans to restructure the ESI in the

country in accordance with the country's membership in SAPP. There are, however, no current plans to restructure BPC. The decisions on energy policy are split between two ministries: the Ministry of Minerals, Energy, and Water (MMEWR) and the Ministry of Environment, Wildlife, and Tourism (MEWT). MMEWR is responsible for national energy policy formulation and provision of energy while the MEWT is tasked with conservation and sustainable use. Botswana is in the process of establishing a regulatory agency, the Botswana Energy and Water Regulatory Agency (BEWRA).

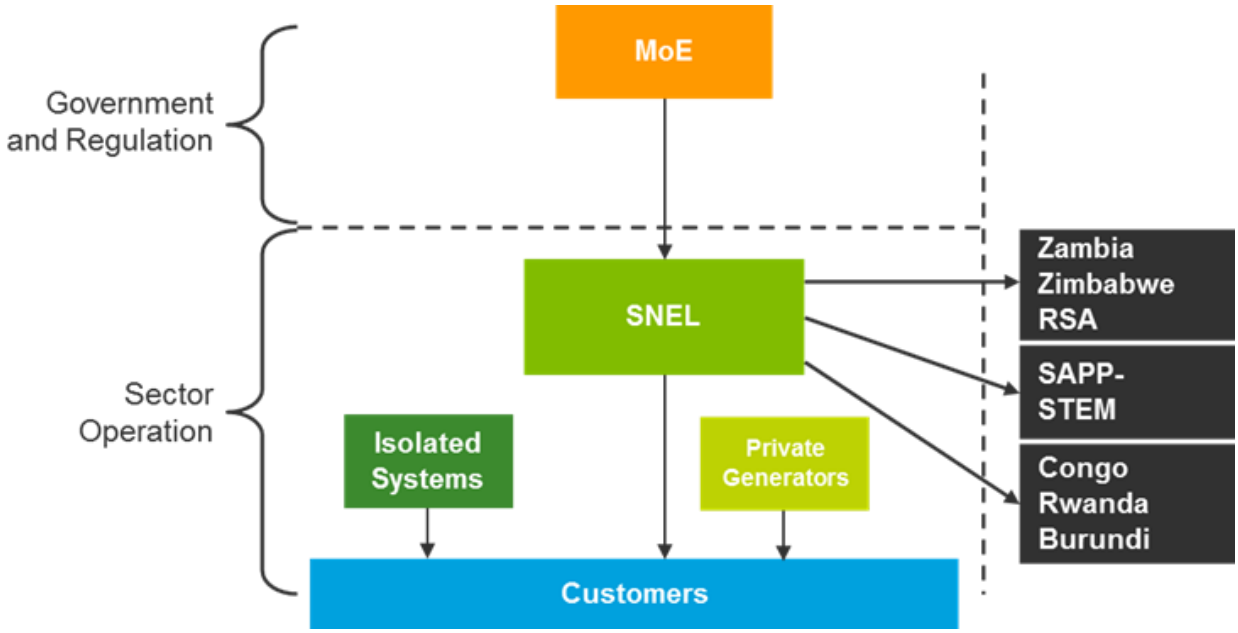
Potential: New generation capacities will most likely be based on coal, given the country's focus on coal exploration and the large untapped deposits in the country. Botswana aims to become a net exporter of power in the region.

6.3. Democratic Republic of Congo

General Information (Data for Year Cited)

Population	79.3 million
Installed Generation Capacity	2,442 MW (2014)
Electrical Energy Consumption	7,584 GWh (2014)
Electrical Energy Production	8,185 GWh (2014)
Hydroelectric	98.6%
Thermal	1.4%
Import/Export	
Imports	95 GWh (2014)
Exports	0 GWh (2012)
Percentage of Population with Grid Connection	9% (2013)

Domestic Electricity Supply Industry Structure



Background: Hydroelectricity provides more than 98% of electricity generated in the DRC. DRC's physical area requires thousands of kilometers of electricity lines to reach users scattered across the country. The power network in the DRC consists of three interconnected networks in the Western, Southern, and Eastern portions of the country, and a number of isolated networks where connection to the main grid is not feasible.

Key Players: The Société National d'Electricité (SNEL) is the state-owned organization responsible for electricity generation and supply. The company reports to the Ministry of Mines, Energy, and Hydrocarbons.

The National Energy Commission (CNE) is responsible for monitoring the energy sector in the country. The Commission consists of an advisory committee, chaired by the Minister for Energy, and a permanent secretariat of approximately 75 members. The CNE is directly responsible for the renewable energy sector of the country, as part of its remit, and has previously conducted studies into the potential use of wind power and micro-hydro for rural electrification. There is no dedicated energy industry regulator, and SNEL is largely self-regulating.

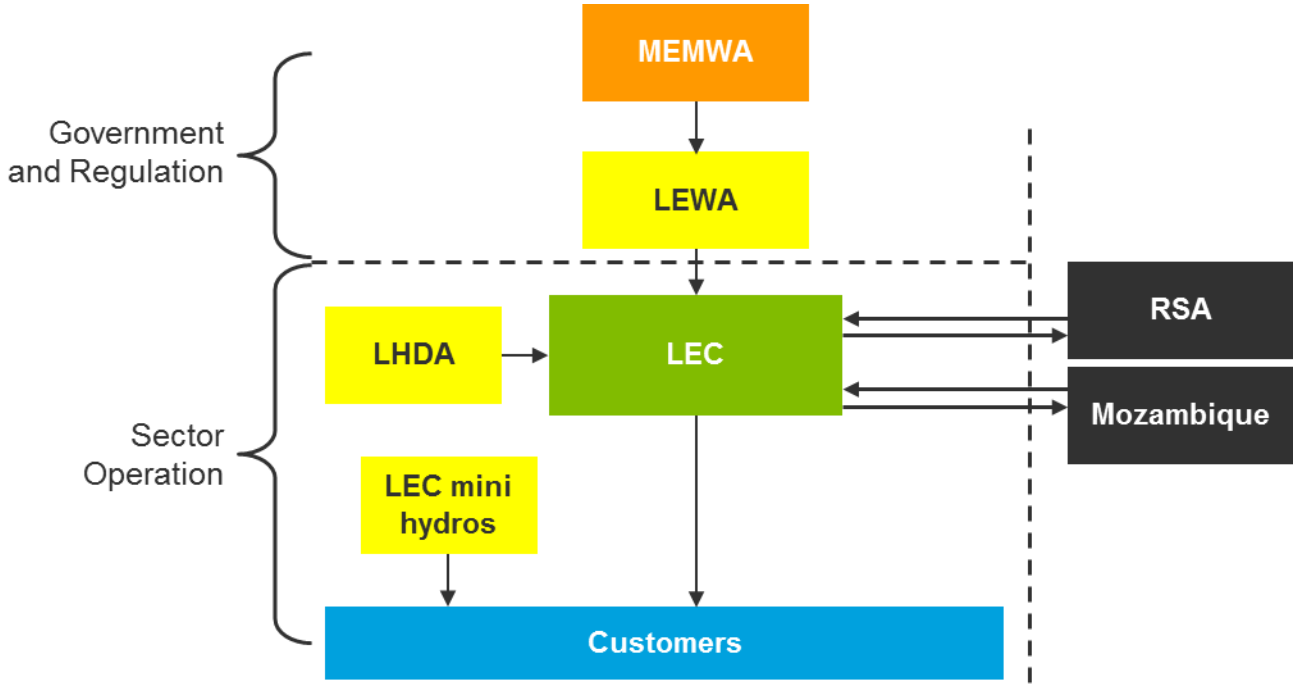
Potential: Hydropower resources are abundant in the country. The DRC's hydropower potential has been estimated by the World Bank and IEA at nearly 100,000 MW, the equivalent of 13% of the world's untapped hydropower potential. While hydroelectricity provides more than 96% of electricity generated in DRC, at present, less than 3% of the DRC's hydropower potential is exploited and, consequently, the domestic rate of electrification remains low and is currently estimated at no more than 9%. The DRC is in a very high level sun belt that makes the installation of photovoltaic systems and the use of thermal solar systems viable throughout the country. The potential for further solar development is high. There is significant potential to produce biogas from plant and animal waste. According to the IEA, the total estimated methane reserves at Lake Kivu are 50 billion cubic meters.

6.4. Lesotho

General Information (All 2014 data)

Population	1.9 million
Installed Generation Capacity	72 MW
Electrical Energy Consumption	680 GWh
Electrical Energy Production	515 GWh
Hydroelectric	100%
Import/Export	
Imports	271 GWh
Exports	Negligible
Percentage of Population with Grid Connection	39%

Domestic Electricity Supply Industry Structure



Background: Lesotho has an abundance of hydroelectric power, which generates most of its electricity needs. However, improving electricity access continues to be a major challenge on the country. Even though the country is relatively small, two-thirds of the country is sparsely inhabited and is comprised of rugged mountains and deep valleys with small scattered villages on mountain sides. The vast majority of the population (76%) lives in rural areas, with the majority of the villages lacking electricity access. Currently, Lesotho's internal generation satisfies only 63% of its demand, and the shortfall is covered by purchasing electricity from Eskom (South Africa) and EDM (Mozambique).

Key Players: The ESI is dominated by two state-owned entities—the Lesotho Electricity Company (LEC), the monopoly transmitter, distributor, and supplier of electricity, and the Lesotho Highlands Development Authority (LHDA), the main internal generator through the Muela hydropower plant (MHP) which has a generating capacity of 72 MW.

The Department of Energy (DoE), which falls under the Ministry of Natural Resources, is the government department responsible for the implementation of all energy policies. The DoE is responsible for overall national energy policy, coordination, and monitoring of energy projects and programs. Since 2006, Lesotho's ESI is regulated by regulator known as the Lesotho Electricity Authority (LEA) which was transformed to a multi sector regulator in 2011. LEWA is also responsible for granting licenses, reviewing and approving tariffs, monitoring their quality of supply, and solving disputes among industry players.

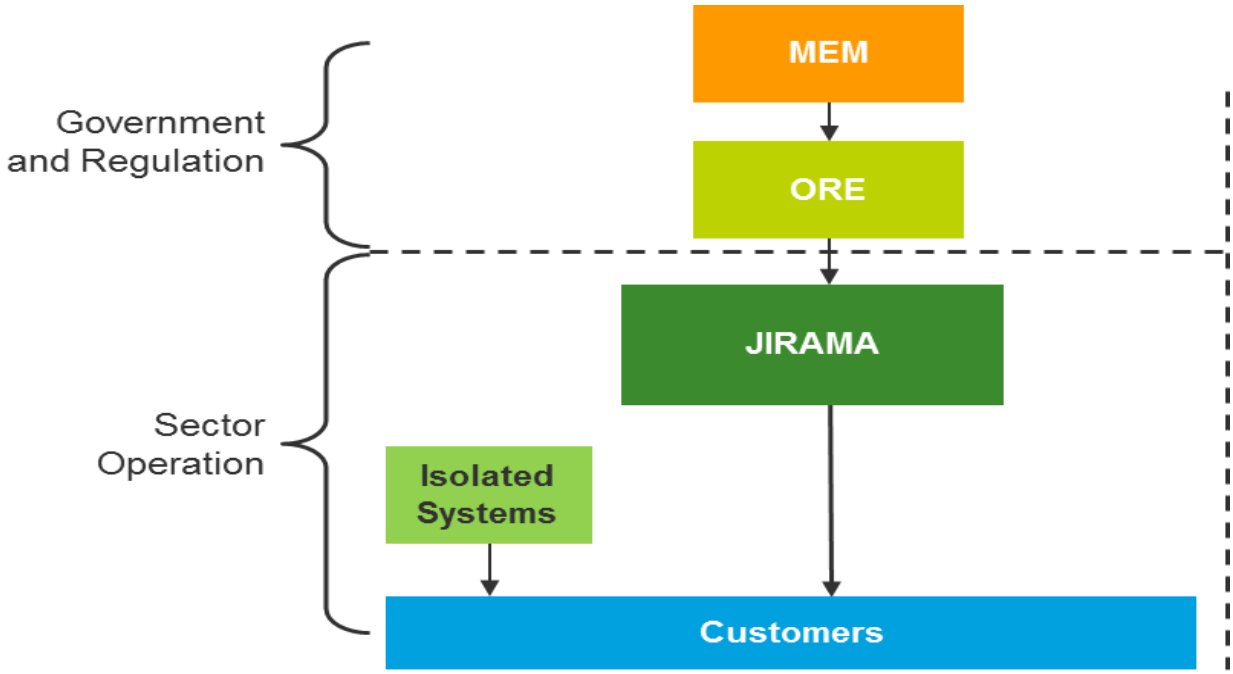
Potential: Lesotho has large and unexploited hydropower potential. However, that potential remains largely untapped, and Lesotho is a net importer of electricity from South Africa. There has been insufficient investment in generation, transmission, and distribution by private investors.

6.5. Madagascar

General Information (All 2014 data)

Population	23.6 million
Installed Generation Capacity	544 MW
Electrical Energy Consumption	1,883 GWh
Electrical Energy Production	2,025 GWh
Hydroelectric	30.1%
Thermal	69.6%
Renewables	0.2%
Import/Export	
Imports	0 GWh
Exports	0 GWh
Percentage of Population with Grid Connection	15%

Domestic Electricity Supply Industry Structure



Background: Madagascar is a net oil importer and more than half of the electricity produced in the country is derived from imported fuel. The ratio of thermal power produced in the country has been increasing in recent years, which has negatively affected the finances of the government and the utility. At present, there are three grids operational in the country: the Antananarivo Grid, the Toamasina Grid, and the Fianarantsoa Grid. All equipment for transmission is administered by the national utility.

Key Players: The Ministry of Energy and Mines (MEM) has jurisdiction over the energy sector, including power sector and mine resources. MEM is responsible for investments and the development of power policies, as well as coordinating and managing foreign assistance requests.

Regulation of the electricity Sector is performed by the Electricity Sector Regulator (ORE). ORE's roles in the sector include controlling prices of electricity and the amount of the royalties of transit, supervising the adherence to the standards of quality of the service, and ensuring that the principles of competition are adhered to. Jiro sy Rano Malagasy (JIRAMA) is the vertically integrated state-managed utility company that supplies electricity and water service in Madagascar. The electricity section of JIRAMA operates and maintains power stations, transmission lines, and distribution lines in the country.

Potential: There is a large potential of renewable energy resources such as hydropower, wind power, and photovoltaic power in the country. The development of these energy resources has only just begun and the government of Madagascar is developing national energy policies that will encourage the migration from traditional fuels to modern energy services[3].

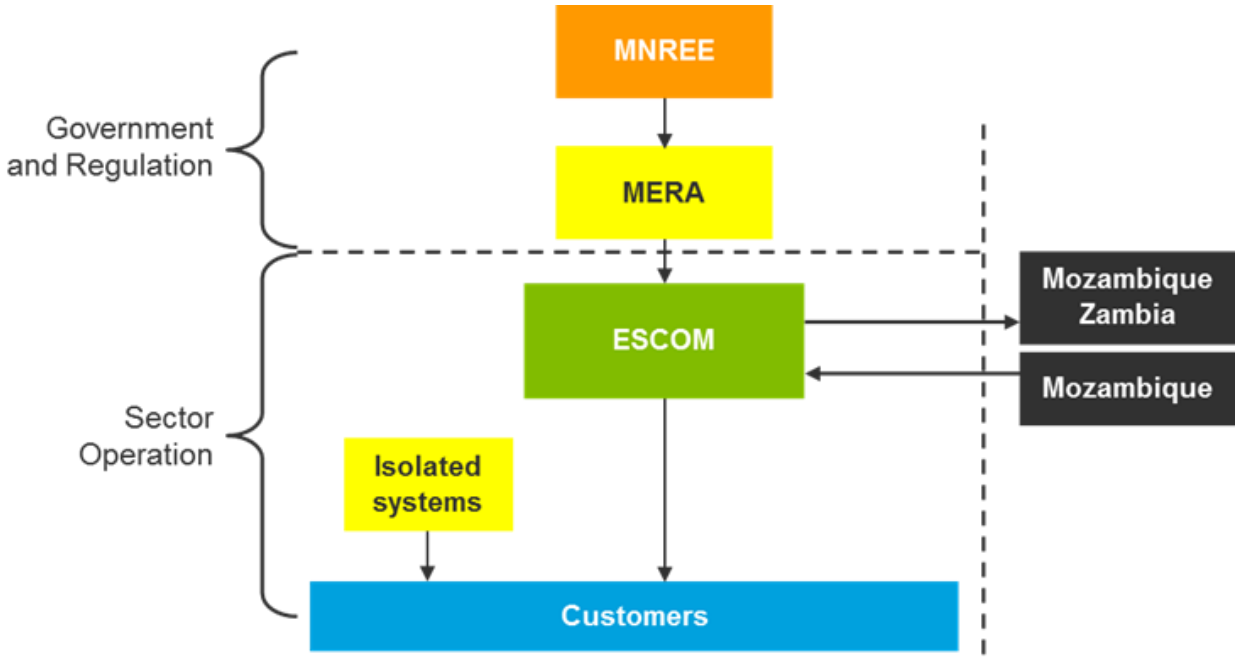
[3] According to the International Energy Agency, modern energy services are defined as household access to electricity and clean cooking facilities (e.g. fuels and stoves that do not cause air pollution in houses).

6.6. Malawi

General Information (All 2014 data)

Population	17.6 million
Installed Generation Capacity	351 MW
Electrical Energy Consumption	1,491 GWh
Electrical Energy Production	1,812 GWh
Hydroelectric	94%
Thermal (grid)	6%
Import/Export	
Imports	Negligible
Exports	22GWh
Percentage of Population with Grid Connection	9%

Domestic Electricity Supply Industry Structure



Background: Malawi has roughly 351 MW of power generation capacity, with four hydropower facilities on the Shire River supplying over 90% of grid-connected electricity. Energy consumption has been growing annually, and domestic supply falls well short of demand. Load shedding has been a frequent occurrence in Malawi in recent years.

Key Players: The Electricity Supply Company of Malawi (ESCOM) is the state-owned integrated utility controlling most of the country's generation, transmission, and distribution assets. ESCOM has suffered from under-investment over many years, and the current transmission and distribution infrastructure is susceptible to overloading, bottlenecks, and poor performance. Additional investment is needed in transmission infrastructure to fulfill planned expansions in generation capacity.

Malawi's National Energy Policy and the Renewable Energy Framework are the primary legal documents governing national energy development. The Department of Energy Affairs (DoEA) is housed within the Ministry of Natural Resources, Energy, and Environment (MNREE), and has oversight over the development and delivery of energy policy in the country. Malawi's energy regulator, the Energy Regulatory Authority (MERA), was established in 2007 to oversee tariff policies and regulate the electricity sector. The DoEA and MNREE retain influence over the level and timing of tariff rate changes in Malawi.

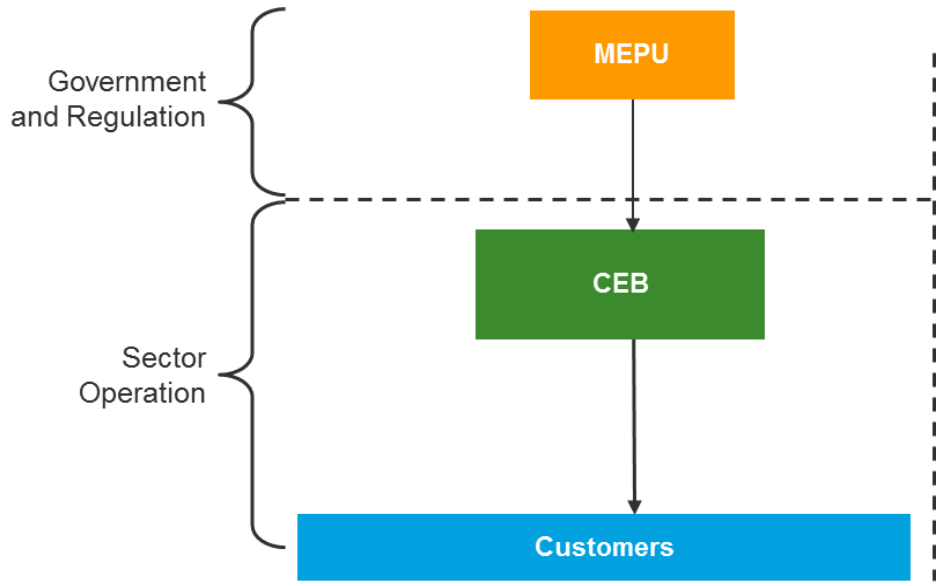
Potential: Malawi has untapped potential in renewables, especially in wind and hydro, and has ongoing reforms of the legal and policy environment to enable IPPs in the renewables sector in the future. Roughly 85% of Malawians live in rural areas that are underserved by grid connections, and off-grid/rural generation projects are likely to be a major component of the country's long term energy planning. MERA issues licenses for any proposed entity involved in generation, subject to DoEA approval. Private generators must sell to ESCOM through a PPA. In 2013, the Millennium Challenge Corporation (MCC) began implementing a $350.7 million compact which seeks to revitalize Malawi's power sector and improve the quality of the nation's power supply. Much of the compact's focus is on increasing capacity and stability of the national electricity grid, as well as strengthening the efficiency and sustainability of hydropower generation.

6.7. Mauritius

General Information (All 2014 data)

Population	1.3 million
Installed Generation Capacity	900 MW
Electrical Energy Consumption	2,658 GWh
Electrical Energy Production	2,885 GWh
Hydroelectric	3.3%
Thermal	96.5%
Renewables	0.2%
Import/Export	
Imports	0 GWh
Exports	0 GWh
Percentage of Population with Grid Connection	100%

Domestic Electricity Supply Industry Structure



Background: Power generation in Mauritius is highly dependent on fossil fuels. The country has no known oil, natural gas, or coal reserves, and therefore depends on imported petroleum products to meet most of its energy needs. As an island country, Mauritius has no potential for interconnection in the event of an outage or insufficient generation capacity. This, therefore, calls for a high reserve margin in the power sector and a well-developed maintenance system to ensure reliable power supply.

Key Players: The Central Electricity Board (CEB), a company wholly owned by the Government has responsibility under the Central Electricity Board Act of 25 January 1964 to "prepare and carry out development schemes with the general object of promoting, coordinating, and improving the generation, transmission, distribution, and sale of electricity" in Mauritius. The Ministry of Energy and Public Utilities (MEPU) is the central body responsible for formulating and implementing the Government's energy policies. Mauritius does not current have a regulator. However, the Utility Regulatory Authority Act was adopted in 2005 and a Regulatory Authority, as approved under the Act, is expected to be established soon. The Regulatory Authority's purview will include regulating third party access to the grid. Currently the sector is regulated by the utility, the CEB.

Potential: Local and renewable energy sources feasible in the country are biomass, hydro, solar, and wind energy. Biomass energy consists mainly of bagasse, a by-product of the sugar industry, and contributes about 22 % of the primary energy supply. Finally, Mauritius has a good solar regime with a potential with above average annual solar radiation as well as a wind regime in some areas.

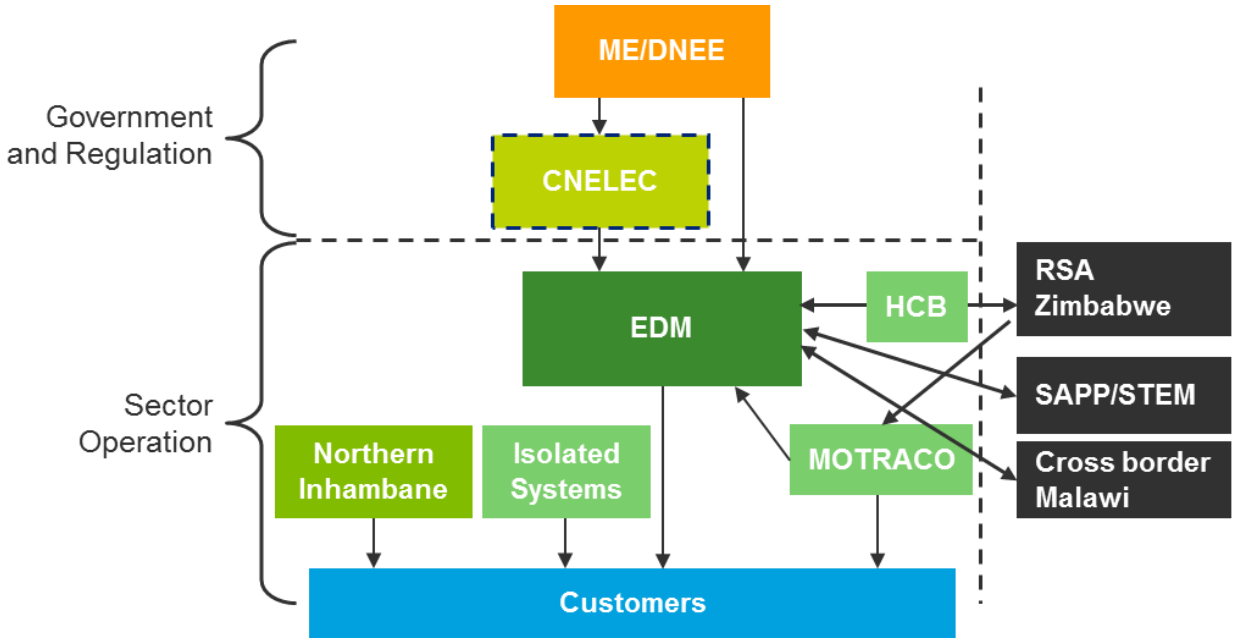
6.8. Mozambique

General Information (Source: International Energy Agency; All 2014 Data)

Population	26.5 million
Installed Generation Capacity	2,308 MW
Electrical Energy Consumption	11,281 GWh (2014)

Electrical Energy Production	14,893 (2014)
Hydroelectric	98%
Gas	2%
Import/Export	
Imports	8,339 GWh
Exports	9,058 GWh (2014)
Percentage of Population with Grid Connection	18% (2014)

Domestic Electricity Supply Industry Structure



Background: Mozambique has a total installed generation capacity of 2,308 MW, comprised almost entirely of one hydropower facility (2,075 MW), with natural gas contributing the remainder. The country is a net exporter of electricity, with 73% of the 2,075 MW generated by the Hidroelectrica de Cahora Bassa (HCB) exported to South Africa. Mozambique's electrification rate is 20% and it is estimated that 26% of urban areas have access to power, while only 5% of the rural areas so. Power transmission in Mozambique is a major constraint. The size of the country and the dispersed nature of its settlements render grid connectivity to the whole population unfeasible. Further, HCB, which is located in western Mozambique, must first sell power to Eskom, which in turn sells it back to Southern Mozambique at an increased rate. As such, there is no direct line between the power source and main load center, Maputo. Additionally, the long distance involved wastes a considerable amount of power due to line losses. Energy demand has grown considerably at an average of 7-8% per year, leading to blackouts.

Key Players: Electricidade de Mocambique (EDM), the state-owned, vertically-integrated electricity supplier, is the major player in the Mozambican electricity sector. While EDM is vertically integrated, it has limited generation capacity of its own. HCB, the major generator and largest hydroelectric scheme in Southern Africa, is an IPP owned by the Mozambican government and the Portuguese electricity grid operator REN. The Mozambican Transmission Company (MOTRACO) is an independent transmission company owned by EDM, Eskom, and Swaziland Electricity Board (each owning 33%), and is responsible for supplying electricity to the Mozal aluminum plant in Mozambique and the wheeling of power to EDM in Mozambique and Swaziland Electricity Company. The Ministry of Energy (ME) is responsible for all energy resources, while the National Directorate for Electrical Energy (DNEE) is the central technical body within ME, responsible for the analysis, preparation, and elaboration of energy policies.

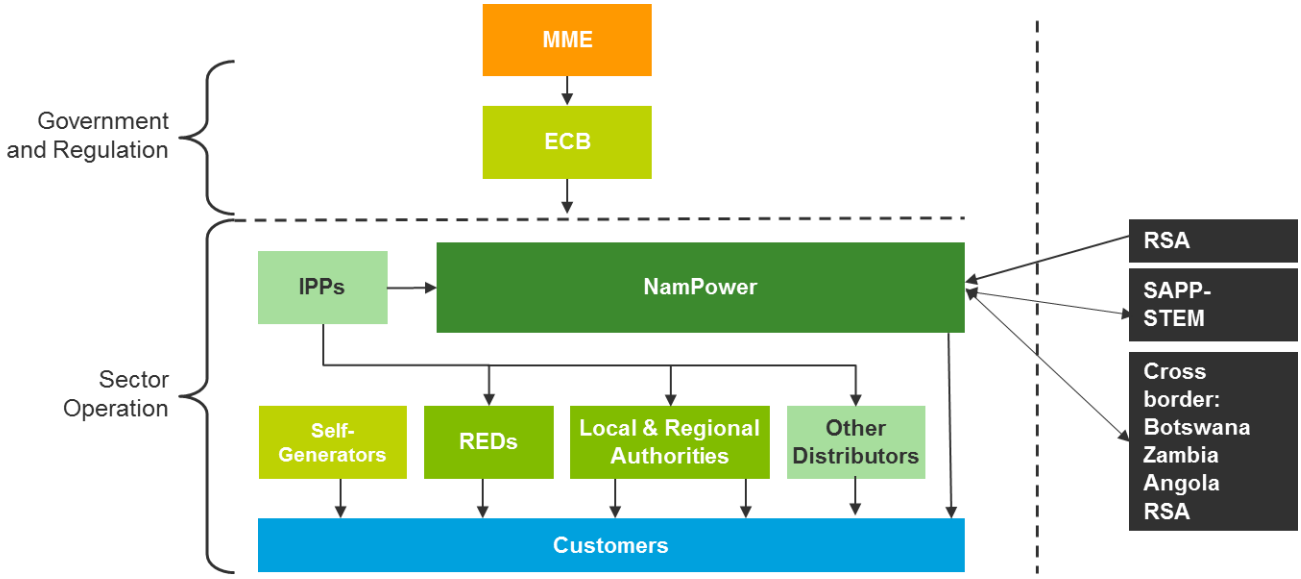
Potential: Mozambique has one of the largest hydroelectric potentials in Africa, and is home to one of the largest hydro dams in the continent, the Cahora Bassa Dam, which has an installed capacity of 2,075 MW and produces electricity for Mozambique, South Africa, Zimbabwe, Botswana, and the Southern African Power Pool. The dam plays an important role in Mozambique's economy as a source of foreign revenue, especially after the country gained majority ownership of the dam (85% of the shares). Despite being endowed with significant renewable energy sources (hydro, biomass, solar, and wind), as well as fossil fuels (natural gas and coal), Mozambique's national grid only serves about 18% of the population and is subject to transmission and high technical and commercial losses (25%). Mozambique is also one of the most promising countries in Africa in terms of natural gas resources, as there have been prolific natural gas discoveries in Mozambique's northern offshore Rovuma basin since 2010. In 2014, the country's natural gas reserves were estimated by the USEIA at 100 trillion cubic feet (Tcf), up from 4.5 Tcf in 2013, placing the country as the third largest natural gas reserve holder in Africa, after Nigeria and Algeria. As of 2014, the government of Mozambique has plans to harness its vast gas reserves, beginning with a planned "City of Gas" in Palma, which will host a giant liquefied natural gas (LNG) plant and a range of energy-intensive industries.

6.9. Namibia

General Information (All 2014 data)

Population	2.2 million
Installed Generation Capacity	501 MW
Electrical Energy Consumption	3,831 GWh
Electrical Energy Production	1,498 GWh
Hydroelectric	96%
Coal	3%
Oil	1%
Import/Export	
Imports	2,885 GWh
Exports	84 GWh
Percentage of Population with Grid Connection	45%

Domestic Electricity Supply Industry Structure



Background: Namibia has roughly 501 MW of power generation capacity spread among four major power plants, although available domestic supply falls well short of current demand. Hydroelectricity produces approximately 96% of Namibia's available generation, with three medium-sized thermal generation plants producing the balance. Energy consumption has been growing at a rate of 3.5% - 5% annually over the past fifteen years, and the country is dependent on imports through SAPP for roughly 60% of electricity consumed.

Key Players: The Ministry of Mines and Energy (MME) is responsible for the formulation of energy policy and development. NamPower is the state-owned integrated utility that operates the country's existing power generation and transmission assets as well as some distribution facilities. The transmission system and trading of electricity are fully managed by NamPower, which is the single buyer and market operator in Namibia. Distribution of electricity is done by three Regional Electricity Distributors and several Local Authorities. The ECB is responsible for regulating electricity generation, transmission, distribution, supply, import, and export in Namibia through setting tariffs and issuance of licenses. The transformation of ECB into a regulator with responsibility for both the electricity and gas sectors is underway. A draft of the Energy and Electricity bill establishing ECB's regulatory authority has been submitted to the Ministry of Mines and Energy for final approval. In addition to setting tariffs, the ECB makes recommendations to the issuing of licenses to the Minister of Mines and Energy for any entity involved in generation, transmission, distribution, and trade of electricity.

Potential: Namibia has significant untapped potential in renewables, especially solar PV and wind power, and has ongoing reforms of the legal and policy environment to enable IPPs in the renewables sector in the future. The country also has significant untapped natural gas potential, which the government has plans to harness. In 2014, Namibian government announced that it would provide additional financing to the National Petroleum Corporation of Namibia (Namcor) for its Kudu gas-to-power project. The Kudu gas field is an offshore project, located approximately 130 kilometers off the southwest coast of Namibia. The main elements of this project are the development of the Kudu gas field and the construction of an 884

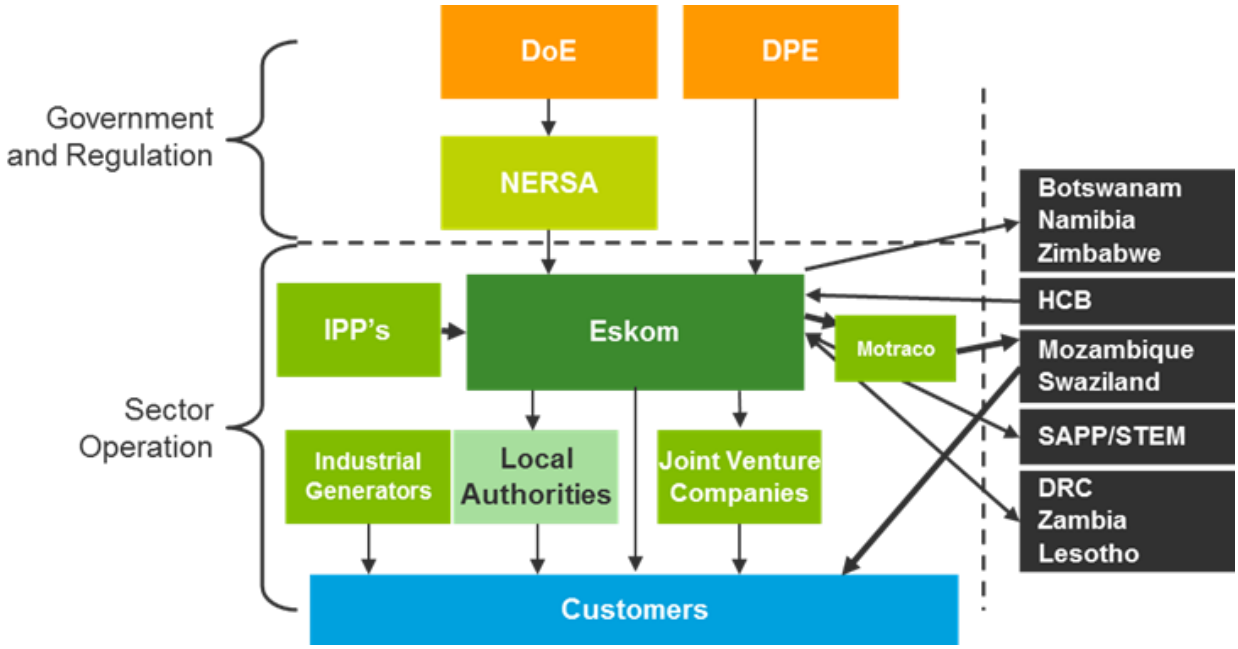
MW combined cycle natural gas-fired power station near Oranjemund in southern Namibia. As an interim solution, private developers have been conducting feasibility studies on a floating LNG terminal project in Walvis Bay called Xaris. The Xaris project would provide LNG for domestic power generation, which would serve as a bridge solution to address Namibia's power shortages until the Kudu gas field development is complete. The transmission grid is a major technical limitation for addressing Namibia's power needs. A high voltage DC line (400 kV – 600 MW) that connects Namibia, Botswana, and Zambia was commissioned in 2010, and Namibia is connected to Angola and South Africa with AC lines.

6.10. South Africa

General Information (All 2014 data)

Population	54 million
Installed Generation Capacity	46,963 MW
Electrical Energy Consumption	224,446 GWh
Electrical Energy Production	237,430 GWh
Coal	93%
Nuclear	5%
Hydroelectric	1%
Renewables	1%
Import/Export	
Imports	542 GWh
Exports	4,909 GWh
Percentage of Population with Grid Connection	85%

Domestic Electricity Supply Industry Structure



Background: South Africa's installed capacity of about 46,963 MW consists almost entirely of thermal generation, with coal fired power stations contributing approximately 93% of capacity, nuclear power contributing about 5%, and the remaining 5% coming from hydroelectric plants, biofuels, solar PV, oil, and a small amount from wind stations.

Key Players: The electricity sector in South Africa is essentially completely vertically-integrated with Eskom, the national utility, supplying approximately 95% of the electricity, with the remainder coming from IPPs and imports. Eskom is involved in every area of the electricity sector, from generation to transmission and retail. Distribution is currently handled by 175 re-distributing municipalities, remnants of the restructuring efforts of the Electricity Distribution Industry Holdings. While Eskom does not have exclusive generation rights, it has a practical monopoly on bulk electricity. Eskom sells in bulk to municipalities that distribute to consumers within their borders, supplies electricity directly to commercial farmers, and, through the Integrated National Electrification Program (INEP), supplies to a large number of residential customers. It also operates the high voltage transmission system in the country.

The Department of Energy (DoE) is the primary government institution responsible for developing energy policies and legislation, and for supporting South Africa's Vision 2025 objective of achieving a 30% renewable energy mix. The National Energy Regulator of South Africa (NERSA) is the regulatory authority that presides over the electricity supply industry. NERSA's functions include issuing licenses, setting and approving tariffs and charges, mediating disputes, gathering information pertaining to gas and petroleum pipelines, and promoting the optimal use of gas resources.

Potential: While South Africa's renewable energy market is still nascent, the country plans to expand renewable electricity capacity to 18,200 MW by 2030. The South African economy is extremely energy intensive, the mining and industrial sectors consume about 60% of the power in the country, while the inclusion of commerce increases share to about 75%. Residential consumers only account for 16- 18% of the power consumed, and poorer households account for an even smaller portion.

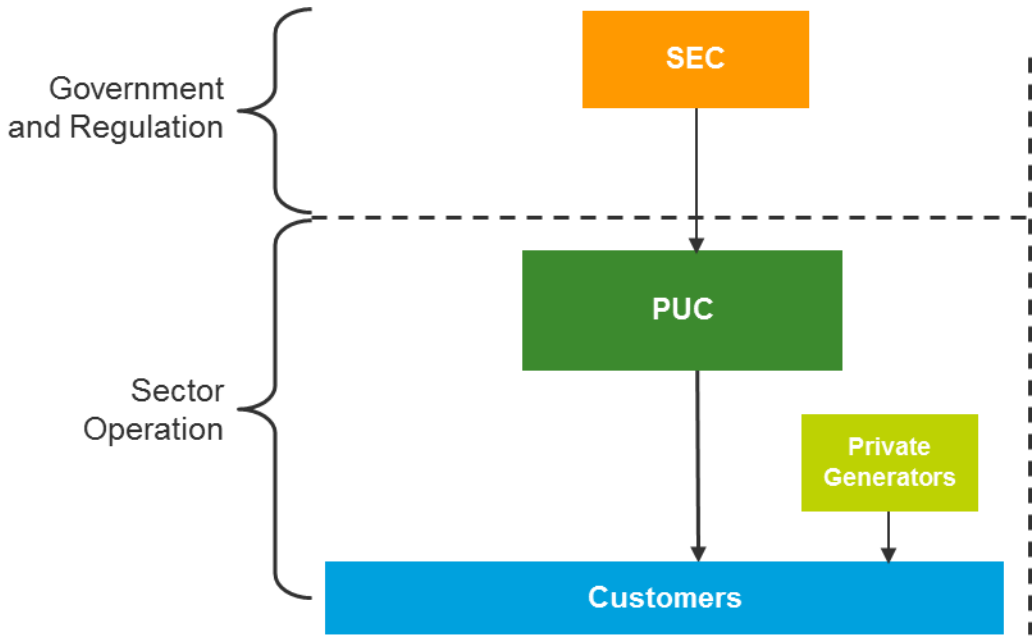
South Africa maintains a central position in the global debate regarding the most effective policy instruments to accelerate and sustain private investment in renewable energy. In 2009, the government began exploring feed-in tariffs for renewable energy, but these were later rejected in favor of competitive tenders. The resulting program, now known as the Renewable Energy Independent Power Producer Procurement Program (REIPPPP), has successfully channeled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices. As of 2014, a total of 64 projects have been awarded to the private sector, and the first projects are already on line. Private sector investment totaling $14 billion has been committed, and these projects will generate 3,922 MW of renewable power.

6.11. Seychelles

General Information (All 2014 data)

Population	100 thousand
Installed Generation Capacity	89 MW
Electrical Energy Consumption	293 GWh
Electrical Energy Production	316 GWh
Hydroelectric	
Thermal	93%
Renewables	7%
Import/Export	
Imports	0%
Exports	0%
Percentage of Population with Grid Connection	97%

Domestic Electricity Supply Industry Structure



Background: Electricity in Seychelles is produced at four diesel-fuel powered thermal power stations servicing the Islands of Mahe, Praslin, and La Digue, as well as the inner islands. Therefore, the country is almost entirely reliant on imported oil for its energy and electricity needs.

Key Players: The Public Utilities Corporation (PUC) is a government-owned corporate body responsible for providing the islands of Seychelles with electricity, water, and sewerage services. The PUC generates approximately 95% of the country's electricity, with the remaining 5% being self-generators for own use. The PUC is also responsible for the transmission, distribution, and sale of electrical energy on the main islands of Seychelles. Currently, the PUC Act does not allow for IPPs to supply electricity to the grid. Seychelles Energy Commission (SEC) is the regulator for the production of energy and has the mandate for setting tariffs in the country.

Potential: Seychelles is in the process of implementing the SIDS DOCK project, which is an initiative among member countries of the Alliance of Small Island States (AOSIS) to assist Small Island Developing States (SIDS) like Seychelles to transform their national energy sectors with environmentally-friendly, cheaper renewable energy and adapt to the challenges posed by climate change. Seychelles has two renewable energy projects: a 6MW wind farm on the main island of Mahé Island and a pilot project for rooftop photovoltaic (PV) systems throughout the main inhabited islands. The island has a target of producing 15% of electricity generation from renewable energy sources by 2030.

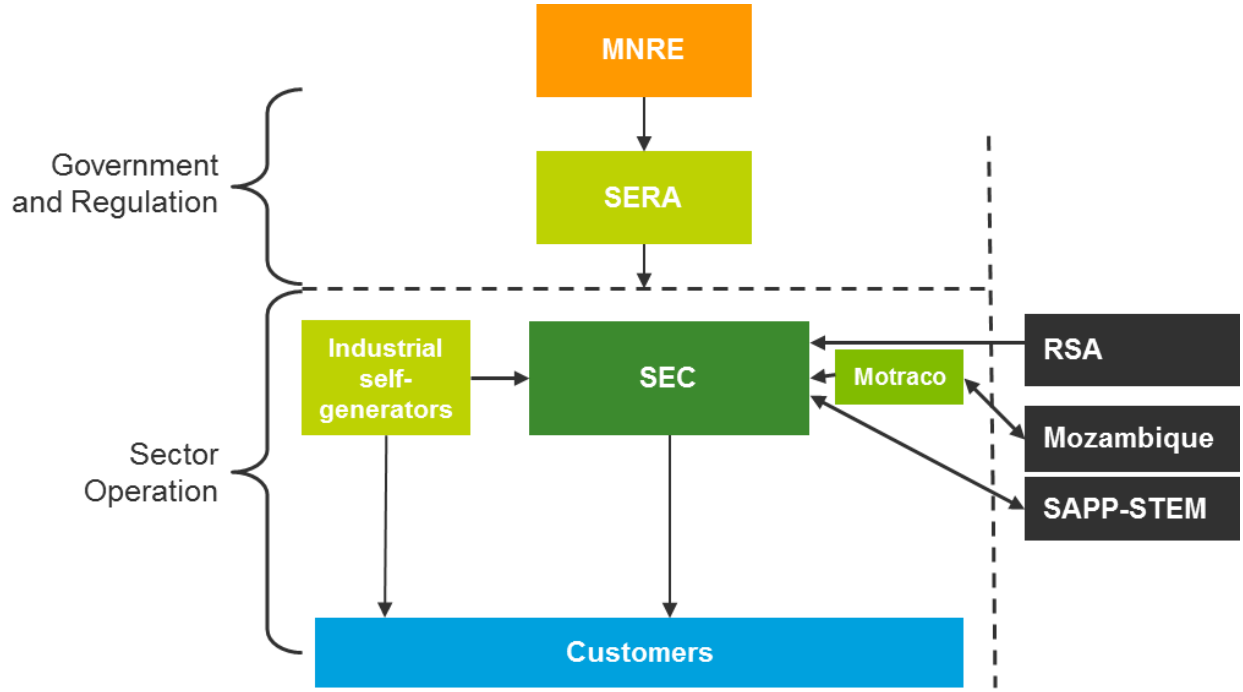
6.12. Swaziland

General Information (All 2014 data)

Population	1.1 million
Installed Generation Capacity	70 MW
Electrical Energy Consumption	1074 GWh
Electrical Energy Production	553 GWh

Import/Export	
Imports	977 GWh
Exports	Negligible
Percentage of Population with Grid Connection	66%

Domestic Electricity Supply Industry Structure



Background: Swaziland's installed capacity of 64 MW consists almost entirely of hydropower. The national utility Swaziland Electricity Company operates four hydropower stations that serve as peaking and emergency power stations. These stations contribute approximately 15-17% of the total energy consumed in the country, with the vast majority of the supply (~80%) coming from Eskom and EDM. A further 9 MW of diesel fired generation is installed at Edwaleni, but is no longer used due to high operational costs.

Key Players: The Swaziland Electricity Company (SEC) has a monopoly on the import, distribution, and supply of electricity in the country. One of the private co-generation plants, Ubombo Sugar Limited, is also an IPP as it sells some of its excess power to SEC, providing about 3% of the country's power needs. The sugar industry, however, is still a net buyer of electricity from SEC. The legal energy policy and planning framework in Swaziland is controlled solely by the government via the Ministry of Natural Resources and Energy. Regulatory authority in the sector lies with the Swaziland Energy Regulatory Authority (SERA). SERA's responsibilities include receiving and processing applications and modifications of licenses, approving tariffs, prices, charges, and terms and conditions of operating a license, and monitoring the performance and the efficiency of licensees. SERA is also responsible for investigating and adjudicating complaints.

Potential: The Ministry of Natural Resources and Energy commissioned a study to establish a database on the potential of developing mini-micro hydropower electricity schemes. A report produced from the

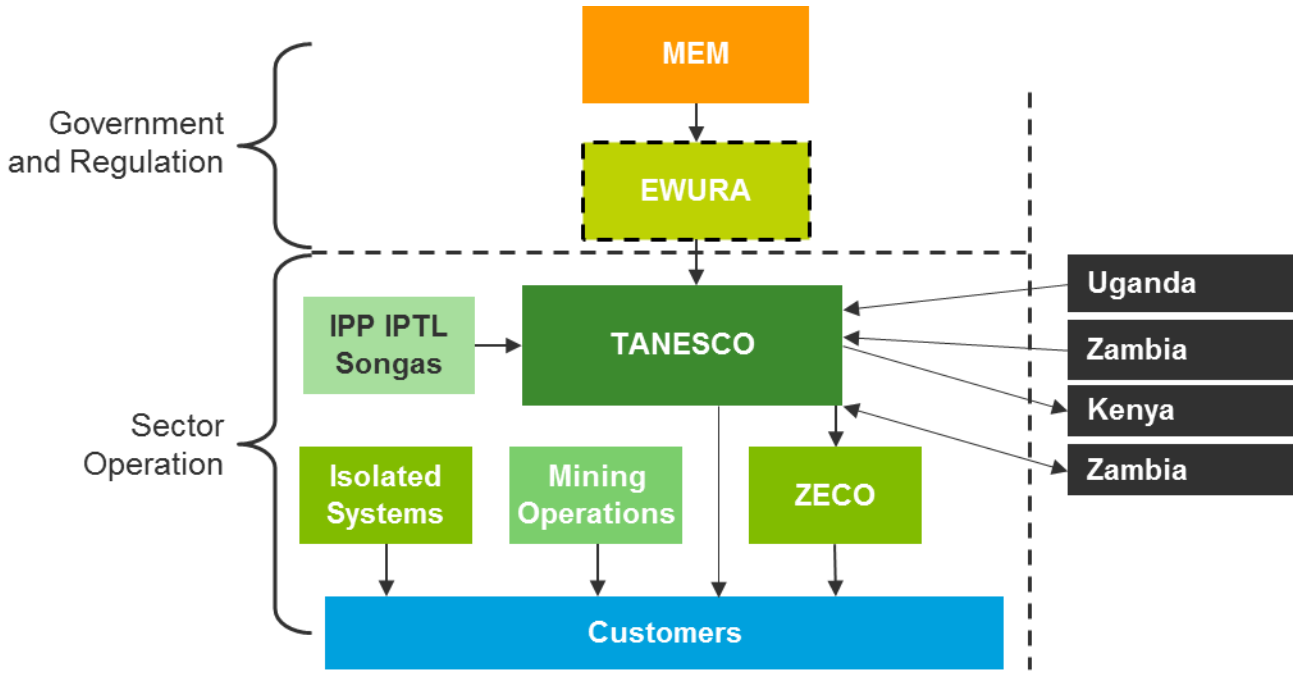
study identified 35 sites, ranging from 0.032 MW to 1.525 MW. The IEA estimates that Swaziland has a gross hydropower potential installed capacity of 200 MW. The main identified barriers to developing projects in the country include the difficulty of mobilizing funding for investments, which leads to severe delays in project implementation, the small size of the local energy market, and limited natural resources in the country.

6.13. Tanzania

General Information (Data from year as marked)

Population	46.7 million
Installed Generation Capacity	1,380 MW
Electrical Energy Consumption	5,193 GWh (2014)
Electrical Energy Production	6,160 GWh (2014)
Gas	47%
Hydroelectric	31%
Oil	22%
Import/Export	
Imports	59 GWh (2013)
Exports	Negligible
Percentage of Population with Grid Connection	24% (2014)

Domestic Electricity Supply Industry Structure



Background: Tanzania's installed capacity of 1,380 MW is almost equally divided among hydro, natural gas, and liquid fuels. Given Tanzania's traditional reliance on hydropower, the country has been very susceptible to drought-induced power shortages. As such, droughts in 2010 resulted in significant power supply shortages and the utility was forced to engage costly emergency power producers to bridge the gap. Demand for electricity in the country has grown on average between 10 to 15% annually.

Key Players: The Ministry of Energy and Minerals (MEM) is responsible for all energy related matters on mainland Tanzania. Under MEM, the Tanzania Electric Supply Company (TANESCO) is the state owned, vertically-integrated utility which is responsible for generation, transmission, and distribution in the country. Regulatory responsibilities of the electricity sector lies with the multi-sector regulatory agency, Energy and Water Utilities Regulatory Authority (EWURA). EWURA has a myriad of responsibilities including licensing, tariff review, and monitoring performance. Administratively, EWURA reports to the Ministry of Water and Irrigation and not to MEM. Tanzania has two large IPPs in operation; Independent Power Tanzania Limited (IPTL), a 100 MW HFO powered plant which was the first IPP to sell power to TANESCO and Songas, a 189 MW natural gas fired plant.

Potential: The US EIA and World Bank have estimated Tanzania's hydro potential at 4,500 MW, of which only around 563 MW is developed. The Tanzanian REA estimates that 100 GWh/year could be produced from micro/mini systems. Currently, only around 32 GWh/year is produced from these smaller systems, many of which are private schemes run by religious missionaries.

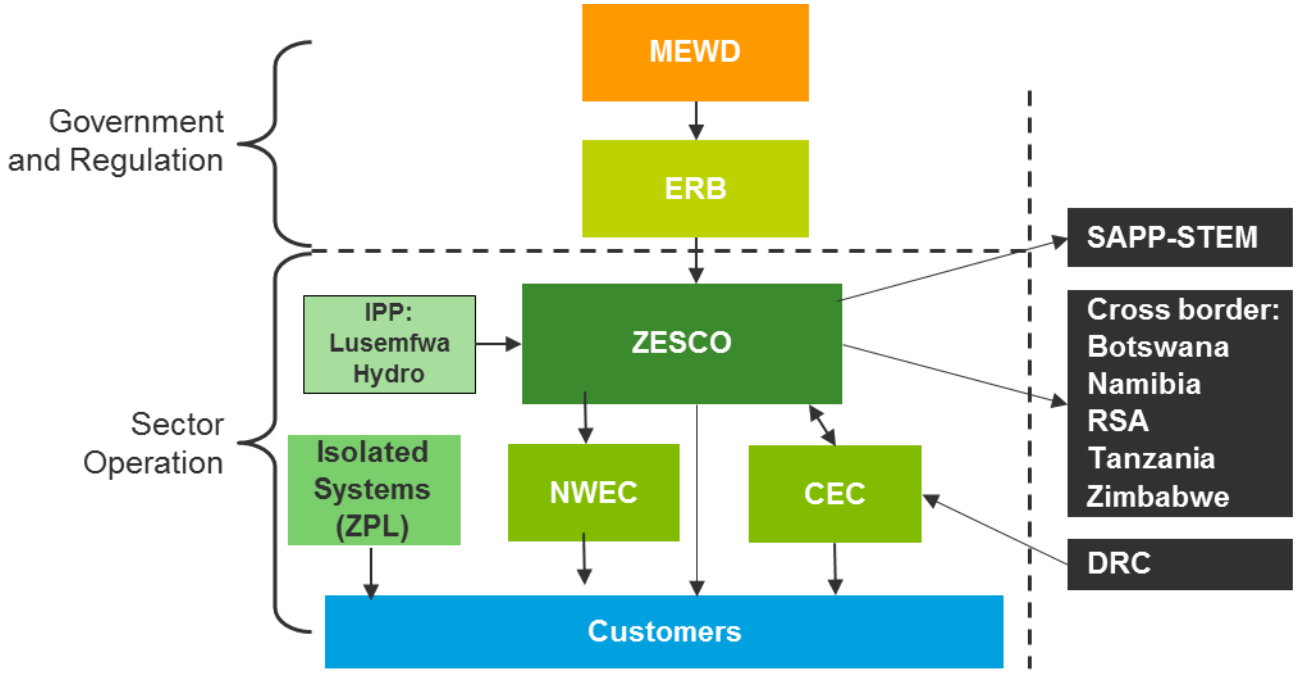
There have been several natural gas discoveries made in offshore southern Tanzania since 2010. The country produced 35 billion cubic feet (Bcf) of natural gas in 2013, all of which was consumed locally. The country expects to marginally increase natural gas production in the next few years from the Mnazi Bay Concession, located in southeast Tanzania in the Ruvuma Basin. In 2015, a 330 mile natural gas pipeline from Mnazi Bay to Dar es Salaam was completed and flows are expected to start in late 2015. The pipeline's capacity is almost 0.8 Bcf per day. In addition, as of 2015, Tanzania is slated to add 150 MW of power to its national grid once it completes construction of the $183 million Kinyerezi I gas-fired plant.

6.14. Zambia

General Information (All 2014 data)

Population	15 million
Installed Generation Capacity	2,128 MW
Electrical Energy Consumption	10,721GWh
Electrical Energy Production	14,452 GWh
Hydroelectric	94%
Oil	6%
Import/Export	
Imports	13 GWh
Exports	1,256 GWh
Percentage of Population with Grid Connection	26%

Domestic Electricity Supply Industry Structure



Background: Zambia has a total installed capacity of 2,396 MW, which is predominantly hydropower (94%) and the rest oil (6%). Growth rates in the demand for power have been estimated at 3% per year for the past few years, while generation capacity has remained fairly stagnant over the past 30 years, despite having approximately 6,000 MW in unexploited hydro power potential. The performance of the mining sector is particularly important for electricity demand, as it accounts for nearly half of Zambia's electricity consumption. However, only 23% of the Zambian population has access to electricity and, in rural areas, the level of access is 3%.

Key Players: The ZESCO Limited (ZESCO) is the state-owned, vertically integrated company responsible for the vast majority of the generation activities in Zambia. Copperbelt Energy Corporation (CEC) is a privately owned company which was created after the privatization of the Zambia Consolidated Copper Mines (ZCCM) power division. CEC owns transmission and distribution networks in the Copper mining region of Zambia and purchases 55% of the power generated by ZESCO, which it in turn supplies to the mines. CEC also owns an additional 80 MW standby/emergency gas generation plant. Finally, Lunsemfwa Hydro Power Corporation is a privately owned IPP created after the privatization ZCCM. It has an installed capacity of about 56 56 MW that it sells to ZESCO under a PPA. The other IPPs are Ndola Energy Company Limited (NECL) with installed capacity of 50MW, Kariba North Bank Extension Corporation (360 MW installed capacity) and Zengamina Power Limited (ZPL) an isolated system with an installed capacity of 0.75 MW supplying power to Ikeleng'e District in North Western Zambia. North Western Energy Corporations (NWEC) owns and operates distribution and supply system that provides electricity to serve the non-mining load of Lumwana, Kabitaka and Kalumbila mine townships and surrounding areas.

The Energy Regulatory Board (ERB) is the regulatory agency in Zambia which is responsible for ensuring utilities earn a reasonable rate of return on investments which are sufficient to provide quality services at affordable prices to the consumer, ensuring that all energy utilities are licensed, monitoring levels and structures of competition, and tariff setting. The Ministry of Energy and Water Development (MEWD) has the overall responsibility for power and both ZESCO and ERB report to MEWD.

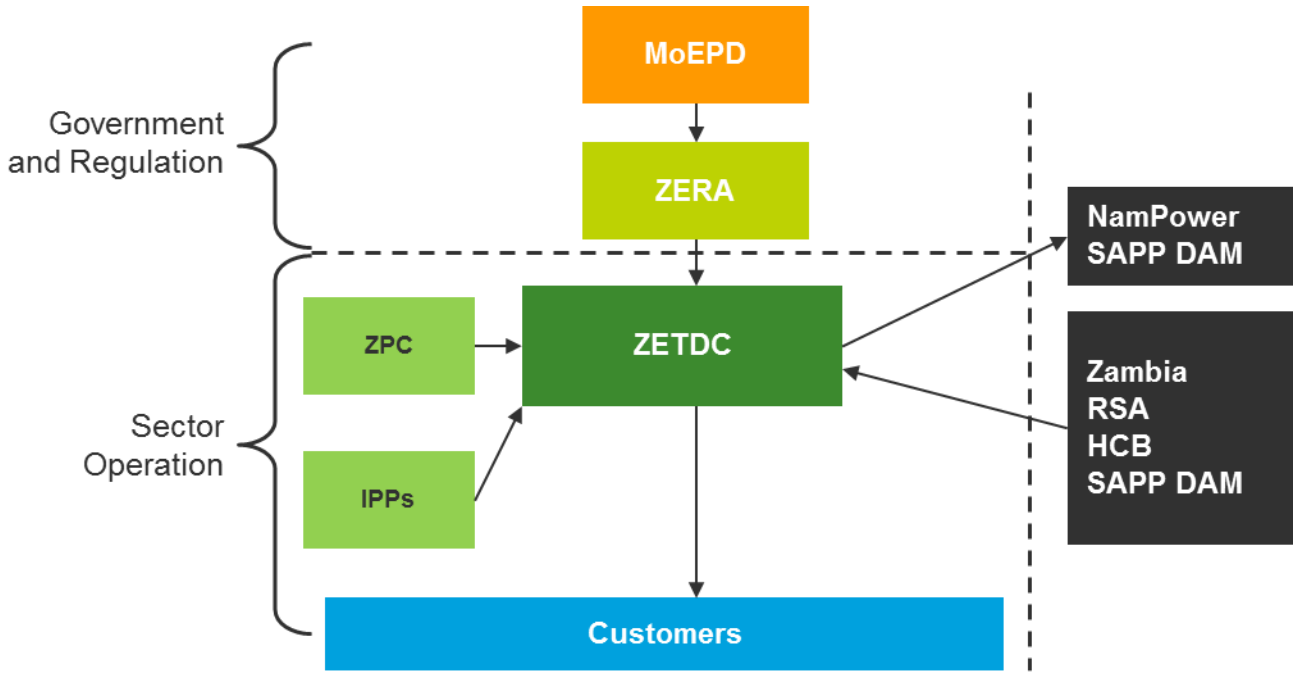
Potential: Zambia has potential hydropower capacity of about 6,000 MW and other renewable energy resources, with only a third of the hydro potential utilized. In order to undertake a project in the electricity sub-sector, any licensee or unlicensed entity intending to construct a new generation, distribution or transmission asset will have to complete and submit and investment endorsement form the ERB. The project developer must also submit, together with the investment endorsement form, a business plan, audited financial statements, proof of funds, certificate of incorporation, and diagrams and schematics of the proposed works. Following the submission of documents, the ERB will inspect the site and if the site passes the inspection, economic valuation for the purpose of tariff determination will start. The project developer is expected to justify their proposed tariff and the ERB will let the developer know which costs are deemed reasonable, justifiable, and purposeful. Subsequently, the ERB will advise the developer of the tariff as well as provide an endorsement that includes the tariff, the approved technical specifications of the project as well as the timetables for completion.

6.15. Zimbabwe

General Information (All 2014 data)

Population	13.3 million
Installed Generation Capacity	2,045 MW
Electrical Energy Consumption	8,280GWh
Electrical Energy Production	9,812GWh
Hydroelectric	53%
Coal	46%
Oil	.6%
Biofuels	.4%
Import/Export	
Imports	979GWh
Exports	1,231GWh
Percentage of Population with Grid Connection	40%

Domestic Electricity Supply Industry Structure



Background: In recent years, as various Zimbabwean facilities have either partially or completely gone off-line due to lack of maintenance. Much of the country's electric power (30%) has come from Mozambique, South Africa, the Democratic Republic of Congo, and other countries in the region. No major new project developments have occurred in the generation sector of the country since the commissioning of the Hwange coal plant, the largest thermal facility in the country, in 1988. It is estimated that only 60% of the country's installed capacity is available. While there are large coal deposits in the country, the company that provides coal to the Hwange Thermal Power Plant does not have the financial resources to significantly boost output.

Key Players: In accordance with government policy to embark on reforms in the electricity sector, a new Electricity Act was enacted in 2002, which brought about the restructuring and unbundling of the Zimbabwe Electricity Supply Authority (ZESA) from a vertically-integrated utility into unbundled successor companies. These reforms were meant to encourage private participation through IPPs, but there has been limited private participation. As such, the incumbent organizations, the government-owned ZESA Holdings, and its subsidiaries still dominate the sector. The vast majority of internal generation is still done by the Zimbabwe Power Company (ZPC), a ZESA Holdings subsidiary that owns and operates four thermal stations and the Kariba Hydropower Station. Transmission and distribution is still solely done by the Zimbabwe Electricity Transmission and Distribution Company (ZETDC), another ZESA Holdings subsidiary. Regulation of the sector is done by the recently formed Zimbabwe Energy Regulatory Authority (ZERA). ZERA is responsible for issuing licenses in the energy sector as well as receiving and evaluating tariff applications. Formulation of the legislative and regulatory frameworks of the electricity sector is handled by the Power Development Department within the Ministry of Energy and Power Development. The Power Development Department is also responsible for administrating the national utility, ZESA Holdings, and its subsidiaries.

Potential: Zimbabwe has been actively seeking IPP bids to improve its power supply situation. IPP procurement is based on unsolicited bids. A number of IPPs have been licenced. However, the country is developing a national integrated energy plan that will guide future IPP procurement.

7.0. Annex B: Considerations for IPP Procurement in the SADC Region

As with most of Sub-Saharan Africa, Southern Africa suffers from widespread energy poverty brought about by lack of access to electricity, high-cost of access, insufficient reforms, and inadequate investment, particularly by the private sector. Improved access and energy security can be achieved with greatly augmented investment in lower-cost technologies, introduction of cleaner and more efficient generation options, and development of a more competitive and transparent power trade throughout the Southern Africa Power Pool (SAPP), in which SADC Member States participate.

In early 2014, available generation capacity throughout the SAPP was 49,244 Megawatts (MW). Including peak demand, suppressed demand, and reserve requirements, the region has a significant shortfall. With regional electricity demand increasing at an estimated 2.5% per year and most utilities in the region lacking cost-reflective tariffs, the supply-demand gap and economic consequences could become significantly worse if planned capacity additions are not achieved by 2016.

With the limited funds available for SADC Member States and state-owned utilities, insufficient investment continues to impact not only the realization of new generation and transmission projects, but also maintenance and rehabilitation activities. Successful reform processes, strengthened regulatory regimes and establishment of sound commercial frameworks, are imperative to attracting outside investment in the form of independent power producers (IPPs) and public-private partnerships (PPPs).

Although increasing private sector investment in individual SAPP countries is essential, one of the greatest potential for long-term benefits is the development of regional power trade and market interconnection, including the development of regional-oriented IPP projects. Achieving this goal requires strong policy, regulatory, and legal frameworks that reduce risk and incentivize investment in IPP projects.

Below we offer a primer on some of the considerations utilities in the region are better served by keeping in mind as they explore engaging the private sector.

7.1. What Constitutes a Bankable IPP Project?

Developing power projects in emerging markets presents challenges and risks, but also many opportunities if those challenges and risks are properly understood and managed. While no two powers sector projects are ever identical, there are consistencies in project design and structuring that increase the attractiveness of the opportunity and improve the chances of success for all parties over the long term. Some of the key tenets in structuring a bankable project are tied to the overall enabling environment in the market, whereas others are project-specific considerations. We have illustrated some of the most important components of bankable power sector projects here:

- Fair allocation of project risks - One of the key features of IPPs is the allocation of risks between the government and the private sector in an effort to achieve a "win-win" scenario for all parties. The private partner will typically provide construction and operational know-how and financing. In exchange, they will look to the government to ensure that payments for delivered energy are made as planned and that any government entities involved in the ESI perform as expected. Well-structured IPP projects create incentives for both the government and private partner to properly manage risks, which helps reduce project costs and creates better value for governments over time.
- Transparency during project procurement and operations – promoting transparency is effective for mitigating corruption, promoting fair decision-making, and building confidence and support among energy stakeholders for the project. An example of such efforts to promote transparency in the SADC region is the Extractive Industries Transparency Initiative (EITI) — a coalition of governments, companies, civil society groups, investors, and international organizations that have agreed to promote transparency in payments made by extractives companies and revenues received by governments from extractives projects. Within SADC, Mozambique, Tanzania, and Zambia are already EITI compliant.
- Independent, transparent regulatory framework – strong and effective regulators who are able to make decisions without political interference form the backbone of an effective sector enabling environment that will attract private capital and accelerate IPP development. Over time, independent regulators that incorporate the interests of all energy stakeholders are essential to developing a secure, reliable ESI.
- Cost reflective tariff structure – private companies look to partner with countries that are migrating away from unsustainable state energy subsidies and towards cost-reflective tariff rates where consumers (and distribution companies) consistently pay for the electricity they consume. RERA's 2014 Tariff Publication is one of the strategies in the SADC region to promote the migration towards a cost-reflective tariff environment by 2019. Tariff structures should include regular adjustment mechanisms prescribed by specific methodologies in the tariff application and rulings.
- Least cost expansion plan to support sector planning – IPPs should be part of a national development plan approved by host governments to achieve policy goals for meeting generation targets, access levels, and energy independence. An IPP that is a core priority under such a national development plan will have the best chance of remaining a low cost provider and receiving timely payments for energy delivered to customers over the long term.
- The political will to support private sector participation is as important as any of the above conditions. Many IPP projects face challenges and changing conditions over time. The government partners that can show stability and commitment to private sector development, even during difficult operating times, will attract increasing numbers of investment partners and achieve greater success on their IPP projects over time.

7.2. Value for Money Considerations

One of the core tools used in global P3 procurement is "Value for Money" (VfM) analysis. To summarize, VfM analysis describes the anticipated difference in risk-adjusted lifecycle costs to the public sector between conventional procurement and P3 procurement of an infrastructure asset or service.

The calculation of the risk-adjusted lifecycle cost of procuring an asset/service through whatever is considered the conventional public procurement method is called the "Public Sector Comparator" (PSC). The risk-adjusted lifecycle cost of procuring the same asset/service from a private party through a P3 mechanism is often referred to as the "Shadow Bid". Multiple Shadow Bids for different types of P3 procurement being considered (e.g., DB, DBOM, DBFM, DBFOM) can be developed in the course of the analysis to select the preferred P3 mechanism for a project.

In a direct comparison, whichever model produces a lower cost is said to provide "Value for Money". The simplified calculation of Value for Money is demonstrated in the equation:

$$VfM = (PSC) - (Shadow\ Bid)$$

Where a positive VfM implies that a P3 procurement is expected to result in better results for the private sector. The practice in many countries is to perform this analysis as part of the approval process for undertaking a project as a P3. In those cases, unless Value for Money can be proven, the project is either aborted, or pursued by conventional procurement means.

The general methodology for a PSC/VFM assessment is as follows:

1. Determine, through cash flow modeling, the life cycle cost of conventional delivery of the project (including design, construction, operations, maintenance, recapitalization/renewal, service provision, and financing) to provide the "raw cost estimate";
2. Quantify the risks (i.e. determine expected cost) to the public sector counterparty of conventional delivery, which when added to the life cycle cost provide the "risk-adjusted cost estimate", or PSC;
3. Using the raw cost estimate as the baseline, estimate the costs to the public sector counterparty if delivered under the P3 model(s). This is done through cash flow modeling of the private partner's financial approach, and may consider expected private sector efficiencies in capital and operating costs, as well as the cost of private financing. The results are known as a "shadow bid"; and
4. Compare the PSC to the shadow bid to determine the Value for Money, if any, offered by the shadow bid