

The cover features a large white circle in the center containing the year '2021'. The background is a collage of three images: a windmill against a sunset sky in the top right, solar panels in a field in the bottom left, and high-voltage power lines in the bottom center. The entire design is overlaid with a pattern of light blue and white triangles.

2021

The Africa Infrastructure Knowledge Program

Power Statistics Pocketbook for Selected African Countries



African Development Bank
Banque africaine de développement

Acknowledgments

The Power Statistics Pocketbook for Selected African Countries was prepared by the Economic and Social Statistics Division of the Statistics Department (ECST) of the African Development Bank in close collaboration with Energy Financial Solutions, Policy and Regulation Department. The staff team was led by Louis Koua Kouakou (Division Manager - ECST1) and Callixte Kambanda (Division Manager - PESR1) and included Yassine Jmal (Senior Statistician), Nirina Letsara (Chief Statistician), Guy Désiré Lakpa (Statistics Assistant), Adam Vickers (Consultant) and Nawel Toumi (Graphic Designer).

The team is grateful for the productive collaboration with participating AIKP country teams, which led to the successful completion of the survey and the compilation of key indicators.

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1. Introduction

This Pocketbook represents the end of this cycle of data collection, verification and publication. The selection of 16 African countries for the power survey was chosen to serve as a representative sample. The data published in this report covers the period 2015-2018. The publication of the report, which had been planned for 2020, was postponed due to the pandemic situation, which caused considerable delays in data collection in the countries. The diverse mix of nations included the very large to the very small, in different areas of the continent, and with economies at various degrees of complexity. Despite the differences in the size, geographical location and economic development of the selected countries, some common themes emerge. These relate to the level of development of their power sectors and concomitant issues such as investment shortfalls and rehabilitation requirements, as well as rural/urban differences in accessibility to grids. The commonality of shared issues and challenges open the discussion on how to improve the generation, transmission and distribution of energy not only in the selected countries but across the whole continent. A separate pressing issue is how to increase the availability of data related to the power sector, in order to identify those areas that require immediate improvement and investment in order to scale up production in both rural and urban areas.

Generation

Most countries in the sample have significant issues with power capacity. Many countries have issues arising from capacity that is not operational, but most countries simply have insufficient total installed capacity. In many ways, this is good news because investments in new generation capacity usually lead to a profitable return on investment. In addition, wind, solar and biomass sources have become much more affordable in recent years and, in most cases, will be equally (or more) efficient to install as new capacity, compared to old-fashioned thermal plants. The choice of “affordability” versus “green” has largely evaporated and presents the region with a technological “leap-frog” opportunity due to the vast deficit in generation capacity.

Transmission

A separate issue confronting most African selected countries is that of transmission, which at all levels appears to be in need of rehabilitation. Although several countries did not record any transmission in need of repair, it seems highly unlikely that this is actually the case. With increasing urbanization and its attendant sprawl, low-voltage transmission systems will require nearly continuous upgrades. High- and medium-voltage systems from older plants are running with systems losses of 5–15%, which again shows the need for transmission investment. Depending on ownership, generators or distributors should be able to capture returns on such investments by reducing these “hidden costs”. On the data side, there is an opportunity for transmission inventory records, which are currently kept by maintenance departments, to be collected at the utility level and aggregated to the national level.

Distribution

Most electricity distributors in this survey have geographically defined monopolies. Yet households and enterprises have introduced competitive supplies by investing in their own small-scale solar and diesel generators. Although the AIKP survey calls for the release of such data, little has been supplied, as it appears that there is usually no such national data source. Yet, to understand the true level of demand at the distribution level, such information is essential, to assess the potential scope of this undercounting.

The companies that have been surveyed are mostly state-owned enterprises (SOEs), with a very few concessionaires. These SOEs are generally struggling with significant hidden costs, as well as prices that appear to be set by their governments below the level of covering costs. Of course, the eternal dilemma is about setting rates that are commercially viable for organizations that were not initially founded as commercial enterprises. Words such as “utility,” “tariffs” or “rate-payers” often characterize the essential organizational problem for these firms, especially when the distribution company is seen primarily as an instrument for implementing government policy.

As with any information-gathering enterprise, this AIKP power sector round may have raised more questions than it has answered. We hope that the results of this survey will provoke discussions and debates about the future of power and its infrastructure in these countries. If it has brought some insights for private investors and public planners, then AIKP has served its core function well.

The data collected for most countries was enough to portray the overall situation, although in some cases data was quite sparse. For Malawi and Djibouti, the data was insufficient to formulate any definitive overview of their power sectors. As the AIKP continues, we expect to focus more sharply on the financial indicators surrounding the health of the power sector’s firms.

2. The Africa Infrastructure Knowledge Program

2.1 Presentation and context

Infrastructure development is a key driver of the African development agenda. It is a critical enabler for economic growth and contributes significantly to human development, poverty reduction and the attainment of the Sustainable Development Goals (SDGs). Since 2010, the African Development Bank (AfDB) has assumed leadership for managing the infrastructure database and knowledge work under its Africa Infrastructure Knowledge Program (AIKP).

The AIKP has a longer-term perspective to provide a platform for (i) regular updating of the infrastructure database on African countries; (ii) defining and developing analytic knowledge products to guide policy and funding decisions and to inform development policy and program management activities; and (iii) building infrastructure statistical capacity in the region. The AIKP is therefore intended to provide a sustainable framework for generating reliable and timely data on the various infrastructure sectors to guide policy design, monitoring and evaluation and to improve the efficiency and delivery of infrastructure services.

2.2 AIKP activities

2.2.1 Establishment of Country Teams in 47 African Countries: So far, 47 African country teams have established and operationalized their country data teams. These teams have the responsibility for managing AIKP activities at the national level, in collaboration with the AfDB statistics team. The number of experts in each country team was increased this year from four to six. Country team members are organized as follows: one focal point based in the National Statistical Office (NSO) responsible for the national coordination of data collection and for direct communication with AfDB experts; one expert based in the Ministry of Finance responsible for the collection of fiscal and SOE financial data, one expert responsible for collecting data on the transportation sector (road, air, sea and rail); one expert in charge of the energy sector, one expert in charge of information and communication technology (ICT), and one expert in charge of the water and sanitation sector. The increase in the number of country team members was motivated by the need to improve data quality in the utility subsectors (energy, ICT, and water & sanitation).

2.2.2 Data Collection and Validation: The AIKP activities have facilitated the extension of data collection across 47 countries with a coverage period from 2005 to 2018. AfDB experts worked with experts from NSOs in coordinating data collection at the country level. Such collaboration was intended to impart the necessary competences in the country officials, to enable them to sustain this activity and incorporate it into their routine statistical programs. The validation of the data collected was carried out during regional workshops held at least once every two years. The workshops bring together all the country experts to review the data and ensure harmonization across countries. Besides the technical data validation, these workshops also provide country participants with an opportunity to exchange their experiences and harmonize their understanding of what constitutes best practice in terms of data collection requirements. The main results obtained were three-fold: (i) an increase in terms of data coverage; (ii) improvement in data quality, and (iii) harmonized best practices aligned with the AIKP methodology.

2.2.3 Development of a Data Collection and Management Tool: The collection, verification and validation of the AIKP data necessitated the development of a data management tool to enhance data integrity and for easier updating and quality control. It also streamlines and unifies data exchange procedures between country teams and the AfDB. The tool allows country teams to update their data in the AIKP database remotely and efficiently. The tool, which was first used during the last data collection and validation exercise, was updated in 2018 to take into account the comments from African countries for certain improvements. The updated data management tool is being used in the current data collection cycle.

2.2.4 Production of Indicators and Data Analysis: This activity involves organizing workshops to generate indicators derived from primary data collected under the program. The indicators generated relate to government fiscal expenditures, in addition to access indicators to energy, water & sanitation, road transport and ICTs. This activity is generally undertaken by sector specialists who have the sector background and knowledge to process and analyze the data. This PocketBook is one of the outputs of this element of the project.

2.2.5 Estimation of Infrastructure Investment Needs: One of the key activities of the AIKP program involves developing investment forecasting models for the infrastructure subsectors (power, transport, ICT, and water & sanitation). The results generated from the models provide a picture of infrastructure investment needs for Africa and for individual countries over the period 2016-2030. Final results of infrastructure investment requirements across Africa show that the continent requires about US\$130–170 billion per year over the next decade to meet its infrastructure investment needs in the energy, transport, ICT, and water & sanitation subsectors.

2.2.6 Dissemination of the infrastructure database through the AfDB's open data portal <http://infrastructureafrica.opendataforafrica.org>

2.3 Data Sources

There are many sources of data that can be tapped for the development of infrastructure statistics. The primary one is the administrative records of infrastructure service providers and associated line ministries and government bodies. These records portray the sector from the supply side, as it is perceived by the institutions responsible for service provision. Furthermore, censuses and surveys of various kinds also provide valuable complementary data from the perspective of the users. In addition to national data sources, numerous public and private global databases can also provide valuable information on Africa's infrastructure.



Country Diagnostic Reports



Country Report — Burundi

National Level

Burundi increased its national energy capacity by just 1% between 2010 and 2018; its 2018 total capacity stood at 38 MW. Similarly, the total electricity generated domestically in Burundi increased by only 11% during the same period, from 241 to 268 GWh. In 2018, a generation shortfall of 84 GWh was met by imports representing just under a quarter of total supply before transmission and distribution. Domestic generation is almost entirely hydropower.

The stagnation in supply is indicative when read in conjunction with household survey data, which reveals that the national percentage of households supplied with electricity doubled to 11% from 2010 to 2018. There was a big difference in the access to electricity though between rural and urban households. Over 61% of urban households had access to power in 2018, but this was true for just 3% for rural households in the same year. While load-shedding information has not been supplied, this could imply an increase in the practice during that period. From an investment point of view, a significant opportunity exists for rapid expansion of generation capacity.

Investment on the generation side is not the only opportunity in Burundi. As already discussed, over 90% of rural households are not connected. This implies a significant opportunity for distribution system investment in the national grid, isolated grid supplies, and a variety of alternative energy solutions at the household level.

The national transmission network seems to have barely expanded during the period 2010–2018, while the portion listed as in need of rehabilitation has also remained static. Experience suggests that a systematic physical inventory of the transmission system would likely yield a substantial investment opportunity. This would be in addition to the need for transmission development brought about by all the potential growth mentioned above.

For investors, the regulatory environment is not straightforward:

- For providers of renewable electricity supplies, there are incentives to promote such installations.
- For suppliers to the grid, the opportunity to launch an independent power provider is provided for in law, although none seems to have brought new capacity online so far.
- With regard to local distribution, there seems to be an accommodative regulatory environment for competition, but no instances of actual investment.

The market seems to have also opened a gap for off-grid and isolated grid providers in the rural areas. There may be other barriers to entry, not specific to the industry, which are not reported here.

Utility Level

The incumbent power provider, La Régie de Production et de Distribution d'eau et d'électricité du Burundi (REGIDESO) has ample room to grow. The number of actual customers (120,000 at 2018) represents only 75% of the potential customers who could be served; this finding aligns with the urban household survey data at the national level. However, while growth in the number of customers connected rose quickly in the period 2010–2016, growth slowed in the two years after that. Without improvements in the availability of supply, revenue growth has also stalled.



Like many utilities on the continent, REGIDESO operates with significant inefficiencies. System losses from transmission and distribution total 31% of electricity generated, whereas an efficient producer would run with losses of about 5–7%. These inefficiencies show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability; in this case at levels representing 45% of actual 2018 revenue. While investment in the transmission and distribution network will yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies could be reduced by moving to a prepaid system.

From 2015 to 2018, labor productivity in sold electricity (MWh per employee) improved modestly by 21%.

ENERGY NATIONAL FACT SHEET

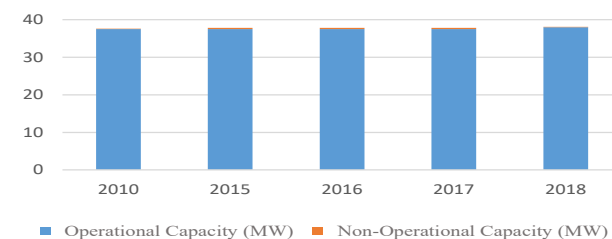
Burundi

INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	37.6	37.8	37.8	37.8	38.1
2. Generation capacity hydro-electric (MW)	32.6	32.8	32.8	32.8	33.1
3. Generation capacity conventional thermal (MW)	5.0	5.0	5.0	5.0	5.0
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	0.0	0.0	0.0	0.0
6. Operational Capacity (MW)	37.5	37.5	37.5	37.5	38.0
7. Non-Operational Capacity (MW)	0.1	0.3	0.3	0.3	0.1
8. Generation capacity of isolated (off grid) systems (MW)	1.0	1.0	1.0	1.0	1.0
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	0.6	0.8	0.8	0.8	0.8
10. Generation capacity of emergency generation (MW)	6.0	6.0	6.0	6.0	6.0
II. Generation					
1. Total Generated (GWh)	241.0	186.5	189.1	260.3	268.2
2. Imported (GWh)	99.0	91.0	119.0	85.0	83.7
3. Exported (GWh)	0.0	0.0	0.0	0.0	0.0
III. Transmission					
1. HV transmission: length (Km)	324.0	324.0	324.0	324.0	324.0
2. HV transmission in need of rehabilitation: length (Km)	72.0	72.0	72.0	72.0	72.0
3. MV transmission: length (Km)	1,346.5	1,346.5	1,346.5	1,346.5	1,346.5
4. MV transmission in need of rehabilitation: length (Km)	97.0	97.0	97.0	97.0	97.0
5. LV transmission: length (Km)	503.0	503.0	503.0	503.0	503.0
IV. Access to electricity					
1. National (% of population)	5.3	8.6	9.6	9.3	11.0
2. Urban (% of urban population)	49.0	57.4	59.0	61.8	61.7
3. Rural (% of rural population)	0.1	1.9	2.7	1.7	3.4
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	no	no	no	no	no
7. Reform: Number of Operators Generation	2	3	3	3	3
8. Reform: Number of Operators Transmission	2	2	2	2	2
9. Reform: Number of Operators Distribution	2	2	2	2	2
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Integrated Monopoly"	"Integrated Monopoly"	"Integrated Monopoly"	"Integrated Monopoly"	"Integrated Monopoly"

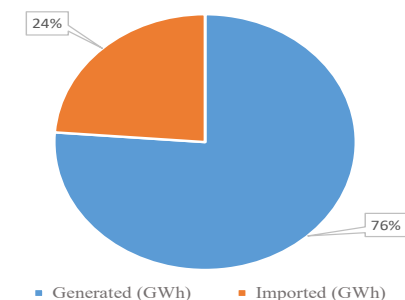
Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

Charts

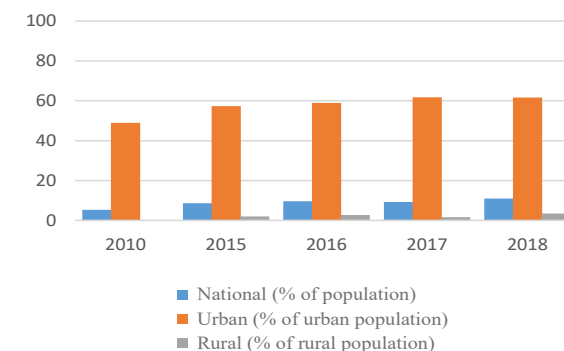
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



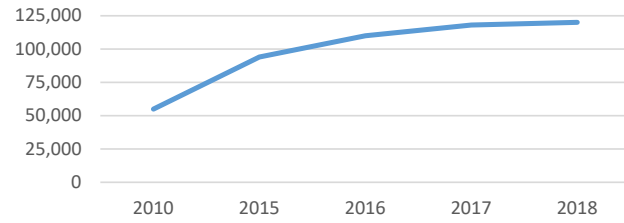
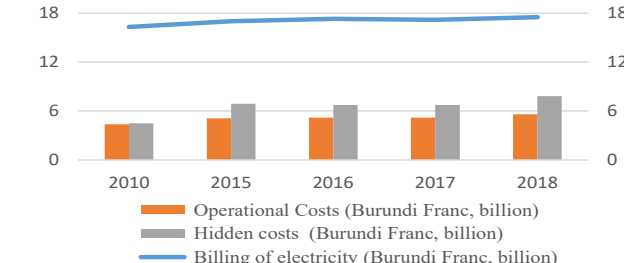
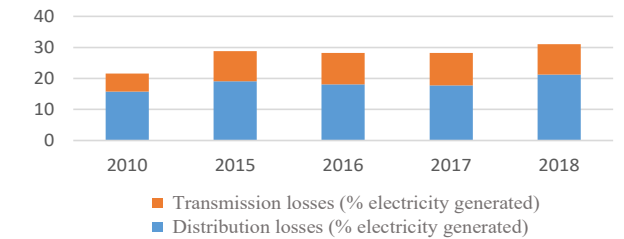
Electricity access



ENERGY UTILITY PERFORMANCE FACT SHEET

COUNTRY NAME: Burundi

UTILITY NAME: REGIDESO- La Régie de Production et de Distribution d'Eau et d'Electricité

INDICATORS	2010	2015	2016	2017	2018	Charts																																																						
						<div><h3>Customers</h3><table><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2010</td><td>55.0</td></tr><tr><td>2015</td><td>94.0</td></tr><tr><td>2016</td><td>110.0</td></tr><tr><td>2017</td><td>118.0</td></tr><tr><td>2018</td><td>120.0</td></tr></tbody></table></div> <div><h3>Operational vs. Hidden Costs</h3><table><thead><tr><th>Year</th><th>Operational Costs (Billion Franc)</th><th>Hidden costs (Billion Franc)</th><th>Billing of electricity (Billion Franc)</th></tr></thead><tbody><tr><td>2010</td><td>4.4</td><td>4.5</td><td>16.3</td></tr><tr><td>2015</td><td>5.1</td><td>6.9</td><td>17.0</td></tr><tr><td>2016</td><td>5.2</td><td>6.7</td><td>17.3</td></tr><tr><td>2017</td><td>5.2</td><td>6.8</td><td>17.2</td></tr><tr><td>2018</td><td>5.6</td><td>7.8</td><td>17.5</td></tr></tbody></table></div> <div><h3>System losses</h3><table><thead><tr><th>Year</th><th>Distribution losses (%)</th><th>Transmission losses (%)</th></tr></thead><tbody><tr><td>2010</td><td>15.8</td><td>5.8</td></tr><tr><td>2015</td><td>19.1</td><td>9.7</td></tr><tr><td>2016</td><td>18.1</td><td>10.1</td></tr><tr><td>2017</td><td>17.8</td><td>10.4</td></tr><tr><td>2018</td><td>21.2</td><td>9.8</td></tr></tbody></table></div>	Year	Customers ('000)	2010	55.0	2015	94.0	2016	110.0	2017	118.0	2018	120.0	Year	Operational Costs (Billion Franc)	Hidden costs (Billion Franc)	Billing of electricity (Billion Franc)	2010	4.4	4.5	16.3	2015	5.1	6.9	17.0	2016	5.2	6.7	17.3	2017	5.2	6.8	17.2	2018	5.6	7.8	17.5	Year	Distribution losses (%)	Transmission losses (%)	2010	15.8	5.8	2015	19.1	9.7	2016	18.1	10.1	2017	17.8	10.4	2018	21.2	9.8
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I. Access (number of customers, '000)																																																												
1. Total actual customers of which:	55.0	94.0	110.0	118.0	120.0																																																							
- Low voltage customers	45.0	82.0	97.0	104.0	106.0																																																							
- Medium voltage customers	0.2	0.2	0.2	0.2	0.2																																																							
- High voltage customers	9.8	11.8	12.8	13.8	13.8																																																							
2. Potential additional customers	20.0	31.0	32.0	36.0	40.0																																																							
II. Financial																																																												
1. Billing of electricity (Burundi Franc, billion)	16.3	17.0	17.3	17.2	17.5																																																							
2. Operational Costs (Burundi Franc, billion)	4.4	5.1	5.2	5.2	5.6																																																							
3. Hidden costs (Burundi Franc, billion)	4.5	6.9	6.7	6.8	7.8																																																							
4. Average effective tariff (Burundi Franc/kwh)	86.2	92.9	83.2	92.5	79.9																																																							
III. Technical																																																												
1. Electricity sold, volume (GWh)	189.0	183.0	208.0	186.0	219.0																																																							
2. Electricity generated, volume (GWh)	241.0	257.0	287.0	259.0	316.0																																																							
3. System losses (% electricity generated) Of which:	21.6	28.8	28.2	28.2	31.0																																																							
- Distribution losses (%)	15.8	19.1	18.1	17.8	21.2																																																							
- Transmission losses (%)	5.8	9.7	10.1	10.4	9.8																																																							
4. Employees (number)	1,303.0	1,566.0	1,476.0	1,424.0	1,412.0																																																							
5. Labor productivity (MWh/employee)	185.0	164.1	194.4	181.9	223.8																																																							

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

Country Report - Comoros

National Level

Comoros increased its national energy capacity between 2010 and 2018 by almost 35% to reach 37 MW. However, the total electricity generated domestically more than doubled in the period 2010–2018 from 37 to 77 GWh. There is no export or import of power to this island nation. Virtually all supplies are from traditional thermal power generation.

The household survey data shows electricity coverage approaching universality at 94% for urban households and at 77% for rural.

The national transmission network has expanded at rates that reflect the growth in connectivity coverage. Medium- and low-voltage transmission increased by 52%. A quarter of the medium-voltage system is reported to be in need of rehabilitation.

For investors, the regulatory environment is closed:

- For providers of renewable electricity supplies, there are incentives to promote such installations. Investors may find household supply opportunities.
- The environment for competitive suppliers at the grid level is closed.

Utility Level

The monopoly power provider is La Société Comorienne de l'eau et de l'électricité, better known as MAMWE; this is also the water utility and has limited opportunities for growth. The actual customer level (88,000 at 2018), has grown slowly since 2015. Revenue growth has slightly outpaced volume increases as tariffs have edged up since 2015.

To a much greater degree than other utilities in the region, MAMWE operates with crippling inefficiencies. System losses from transmission and distribution and unbilled supplies together account for nearly half of production, and this situation has deteriorated since 2015. While investment in the distribution and older parts of the transmission network will likely yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

Labor productivity at MAMWE remained subdued over the latest recorded four-year period, ranging from 55 MWh/employee in 2015 to 75 MWh/employee in 2018.

ENERGY NATIONAL FACT SHEET COMOROS

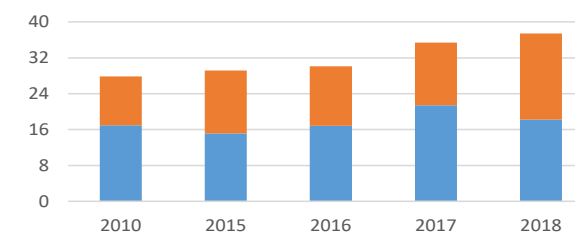
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	27.8	29.2	30.1	35.4	37.4
2. Generation capacity hydro-electric (MW)	0.1	0.3	0.3	0.3	0.3
3. Generation capacity conventional thermal (MW)	27.7	28.9	29.8	35.1	37.2
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	0.0	0.0	0.0	0.0
6. Operational Capacity (MW)	17.0	15.2	16.9	21.4	18.2
7. Non-Operational Capacity (MW)	10.9	14.0	13.2	14.0	19.2
8. Generation capacity of isolated (off grid) systems (MW)	...	0.7	0.7	0.7	0.7
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	...	0.7	0.7	0.7	0.7
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	37.0	67.6	70.4	73.5	76.8
2. Imported (GWh)	0.0	0.0	0.0	0.0	0.0
3. Exported (GWh)	0.0	0.0	0.0	0.0	0.0
III. Transmission					
1. HV transmission: length (Km)	...	...	...	...	...
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	...	564.0	591.0	601.4	822.4
4. MV transmission in need of rehabilitation: length (Km)	...	146.0	163.0	181.0	203.0
5. LV transmission: length (Km)	...	591.0	675.0	737.0	933.0
IV. Access to electricity					
1. National (% of population)	70.1	74.4	76.9	79.4	81.9
2. Urban (% of urban population)	85.7	89.0	90.7	92.4	94.0
3. Rural (% of rural population)	64.0	68.6	71.4	74.2	77.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	no	no	no	no	no
7. Reform: Number of Operators Generation	1	1	1	1	1
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	1	1	1	1	1
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	no	yes	yes	yes	yes
14. Reform: Market Model	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

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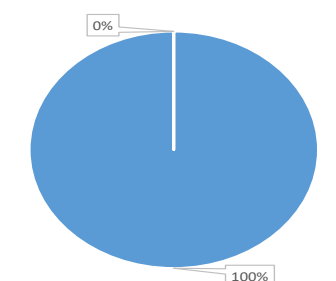
Charts

Operational vs. Non-Operational Capacity



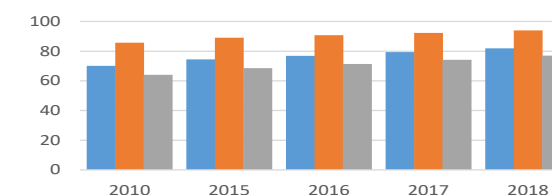
■ Operational Capacity (MW) ■ Non-Operational Capacity (MW)

Generated vs. Imported Electricity: 2018



■ Generated (GWh) ■ Imported (GWh)

Electricity access

■ National (% of population)
■ Urban (% of urban population)
■ Rural (% of rural population)



ENERGY UTILITY PERFORMANCE FACT SHEET

COUNTRY NAME: COMOROS

UTILITY NAME: MAMWE- La Société Comorienne de l'eau et de l'électricité

INDICATORS	2010	2015	2016	2017	2018	Charts																														
						<div><h3>Customers</h3><table><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2015</td><td>75.1</td></tr><tr><td>2016</td><td>75.2</td></tr><tr><td>2017</td><td>82.5</td></tr><tr><td>2018</td><td>87.6</td></tr></tbody></table></div> <div><h3>Operational vs. Hidden Costs</h3><table><thead><tr><th>Year</th><th>Operational Costs (billion)</th><th>Hidden costs (billion)</th><th>Billing of electricity (billion)</th></tr></thead><tbody><tr><td>2015</td><td>5.8</td><td>4.4</td><td>5.2</td></tr><tr><td>2016</td><td>...</td><td>...</td><td>...</td></tr><tr><td>2017</td><td>...</td><td>...</td><td>...</td></tr><tr><td>2018</td><td>7.0</td><td>...</td><td>...</td></tr></tbody></table></div>	Year	Customers ('000)	2015	75.1	2016	75.2	2017	82.5	2018	87.6	Year	Operational Costs (billion)	Hidden costs (billion)	Billing of electricity (billion)	2015	5.8	4.4	5.2	2016	2017	2018	7.0
Year	Customers ('000)																																			
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2015	5.8	4.4	5.2																																	
2016																																	
2017																																	
2018	7.0																																	
I. Access (number of customers, '000)																																				
1. Total actual customers of which:	...	75.1	75.2	82.5	87.6																															
- Low voltage customers	...	75.0	75.1	82.4	87.5																															
- Medium voltage customers	...	0.1	0.1	0.1	0.1																															
- High voltage customers	...	0.0	0.0	0.0	0.0																															
2. Potential additional customers	...	25.8	22.6	21.4	19.3																															
II. Financial																																				
1. Billing of electricity (Comoros Franc, billion)	...	5.8	4.4	5.2	7.0																															
2. Operational Costs (Comoros Franc, billion)																															
3. Hidden costs (Comoros Franc, billion)																															
4. Average effective tariff (Comoros Franc/Kwh)	...	120.0	132.0	132.0	132.0																															
III. Technical																																				
1. Electricity sold, volume (GWh)	...	48.5	33.2	39.2	53.0																															
2. Electricity generated, volume (GWh)	37.0	67.6	70.4	73.5	100.0																															
3. System losses (% electricity generated) Of which:																															
- Distribution losses (%)																															
- Transmission losses (%)																															
4. Employees (number)	...	1,228.0	1,214.0	1,303.0	1,325.0																															
5. Labor productivity (MWh/employee)	...	55.0	58.0	56.4	75.5																															

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Democratic Republic of the Congo

National Level

The Democratic Republic of Congo (DRC) slightly increased its nominal national grid energy capacity between 2010 and 2018 to 2,608 MW, which is less than a 1% increase per year. However, 45% of that capacity has been non-operational since 2015. Actual power generation increased by nearly 40% from 2010–2018. The DRC imported about 7% of its power in 2018.

Virtually all the growth in capacity has been in traditional thermal generation.

The household survey data indicates that the proportion of households supplied with electricity has grown to nearly 20%. Urban inclusion by the grid has moved past the 50% mark, but rural areas are reported to be completely unconnected. This tracks closely to the growth in actual generation.

The length of the national transmission network has shrunk overall by 30%. However, on closer inspection it appears that half of the older low-voltage network has been removed, while the medium- and high-voltage transmission network has grown by nearly 50%. Nonetheless, growth was quite slow in the period 2014–2018.

While no part of the transmission system is reported to be in need of rehabilitation, this is likely to be an example of under-reporting, given the age of the system and the level of system losses reported by the largest utility. Experience suggests a systematic physical inventory of the transmission system would likely yield a substantially larger investment opportunity than is immediately apparent. As the grid moves into more underserved rural areas, the need for investment in transmission will also multiply.

For investors, the regulatory environment is difficult:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural areas; which represents an interesting area for renewable providers, in addition to households.
- For suppliers to a grid, the opportunity to launch an independent power provider is problematic, as there is no permissive legal structure.
- On the side of local distribution, there are three geographically defined monopoly providers. There is no legal framework to support competition in distribution.

Utility Level

The largest power provider, Société Nationale d'Électricité (SNEL), has significant opportunities to grow and to upgrade its grid. Its 663,000 actual customers, as at 2018, represent less than a quarter of those who could be served. This tally remained stagnant over the years 2015–2018.

Although electricity revenue more than doubled from 2010 to 2015, from 308 billion to 657 billion Congolese Francs, revenue fell in 2016 and then remained fairly stagnant below the 630 billion mark. That stagnation is similarly reflected in actual volume growth.



Like many utilities in the region, JIRAMA operates with significant inefficiencies. System losses, last reported in 2017, had more than doubled since 2010 to 29% of electricity generated (there is no breakdown in transmission versus distribution losses). An efficient producer would run with losses of about 5–7%, but this level of losses is at the high end in the region. These show up as “hidden costs” or lost revenue opportunities. This burden on the firm’s opportunity for profitability was equivalent to 38% of its electricity revenue in 2017. The opportunity for investment in improving the network is likely to yield a high return.

In volume terms, the labor productivity of SNEL is in the middle of the range in the region at only 1,670 MWh per employee.



ENERGY NATIONAL FACT SHEET CONGO, DEM. REP.

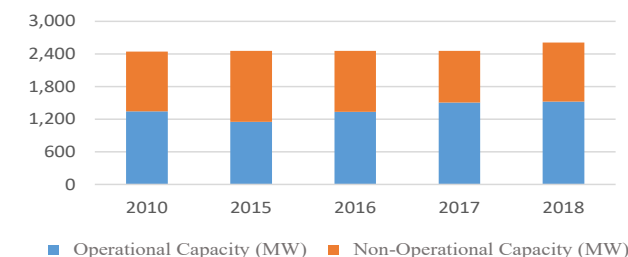
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	2,442.0	2,455.4	2,455.4	2,455.3	2,608.5
2. Generation capacity hydro-electric (MW)	2,416.0	2,426.9	2,426.9	2,426.9	2,576.9
3. Generation capacity conventional thermal (MW)	26.0	28.5	28.5	28.4	31.5
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	0.0	0.0	0.0	0.0
6. Operational Capacity (MW)	1,343.0	1,152.9	1,337.1	1,508.5	1,525.5
7. Non-Operational Capacity (MW)	1,099.0	1,302.5	1,118.4	946.8	1,083.0
8. Generation capacity of isolated (off grid) systems (MW)	...	...	...	...	...
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	44.2	37.1	36.1	21.6	24.8
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	7,600.0	8,960.4	9,142.5	9,814.5	10,549.3
2. Imported (GWh)	164.8	1,058.7	778.4	788.5	799.0
3. Exported (GWh)	...	37.4	50.2	45.4	74.7
III. Transmission					
1. HV transmission: length (Km)	5,510.0	6,215.2	6,771.2	6,788.4	6,936.9
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	2,964.0	4,538.4	4,424.6	4,743.0	5,525.9
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	32,015.0	13,233.4	13,369.9	14,462.7	15,632.7
IV. Access to electricity					
1. National (% of population)	12.7	16.4	17.4	18.2	19.0
2. Urban (% of urban population)	37.9	45.9	47.5	49.1	50.7
3. Rural (% of rural population)	...	...	...	...	...
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	no	no	no	no	no
7. Reform: Number of Operators Generation	3	3	3	3	3
8. Reform: Number of Operators Transmission	3	3	3	3	3
9. Reform: Number of Operators Distribution	3	3	3	3	3
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

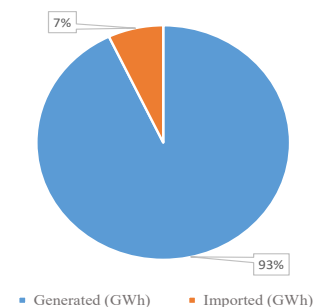
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Charts

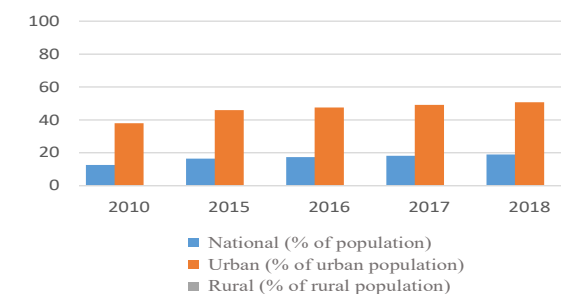
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



Electricity access





ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: CONGO, DEM. REP.
UTILITY NAME: SNEL- Société Nationale d'Electricité

INDICATORS	2010	2015	2016	2017	2018	Charts																																										
						<div><h3>Customers</h3><table border="1"><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2010</td><td>440.3</td></tr><tr><td>2015</td><td>622.2</td></tr><tr><td>2016</td><td>635.5</td></tr><tr><td>2017</td><td>613.2</td></tr><tr><td>2018</td><td>662.6</td></tr></tbody></table></div> <div><h3>Operational vs. Hidden Costs</h3><table border="1"><thead><tr><th>Year</th><th>Operational Costs (billion CFA)</th><th>Hidden costs (billion CFA)</th><th>Billing of electricity (billion CFA)</th></tr></thead><tbody><tr><td>2010</td><td>567.0</td><td>44.4</td><td>308.1</td></tr><tr><td>2015</td><td>887.3</td><td>186.5</td><td>657.6</td></tr><tr><td>2016</td><td>870.1</td><td>216.5</td><td>604.8</td></tr><tr><td>2017</td><td>...</td><td>235.7</td><td>621.4</td></tr></tbody></table></div> <div><h3>System losses</h3><table border="1"><thead><tr><th>Year</th><th>System losses (%)</th></tr></thead><tbody><tr><td>2010</td><td>12.8</td></tr><tr><td>2015</td><td>24.0</td></tr><tr><td>2016</td><td>28.0</td></tr><tr><td>2017</td><td>29.0</td></tr></tbody></table></div>	Year	Customers ('000)	2010	440.3	2015	622.2	2016	635.5	2017	613.2	2018	662.6	Year	Operational Costs (billion CFA)	Hidden costs (billion CFA)	Billing of electricity (billion CFA)	2010	567.0	44.4	308.1	2015	887.3	186.5	657.6	2016	870.1	216.5	604.8	2017	...	235.7	621.4	Year	System losses (%)	2010	12.8	2015	24.0	2016	28.0	2017	29.0
Year	Customers ('000)																																															
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I. Access (number of customers, '000)																																																
1. Total actual customers of which:	440.3	622.2	635.5	613.2	662.6																																											
- Low voltage customers	438.4	620.6	634.0	611.5	661.0																																											
- Medium voltage customers	1.9	1.5	1.5	1.6	1.6																																											
- High voltage customers	0.0	0.0	0.0	0.0	0.0																																											
2. Potential additional customers	3,031.0	3,162.6	3,016.2	2,751.0	2,828.8																																											
II. Financial																																																
1. Billing of electricity (Congolese Franc, billion)	308.1	657.6	604.8	621.4	631.4																																											
2. Operational Costs (Congolese Franc, billion)	567.0	887.3	870.1																																											
3. Hidden costs (Congolese Franc, billion)	44.4	186.5	216.5	235.7	...																																											
4. Average effective tariff (Congolese Franc/kwh)	46.0	87.0	87.0	86.0	83.0																																											
III. Technical																																																
1. Electricity sold, volume (GWh)	6,697.0	7,559.0	6,951.2	7,226.0	7,607.0																																											
2. Electricity generated, volume (GWh)	7,517.2	8,929.8	8,889.1	9,450.2	10,561.0																																											
3. System losses (% electricity generated) Of which:	12.8	24.0	28.0	29.0	...																																											
- Distribution losses (%)																																											
- Transmission losses (%)																																											
4. Employees (number)	7,183.0	6,976.0	6,774.0	6,552.0	6,323.0																																											
5. Labor productivity (MWh/employee)	1,046.5	1,280.1	1,312.2	1,442.3	1,670.3																																											

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



Country Report – Djibouti

National Level

Djibouti maintained its generation capacity at 125 MW from 2015–2018, all of which is thermal. During the period 2015–2018, national generation rose from 364 GWh to 568 GWh. However, the country also raised its imported supply of electricity by the same amount, so that in 2018 almost half of the national supply was imported, as was the case in 2015.

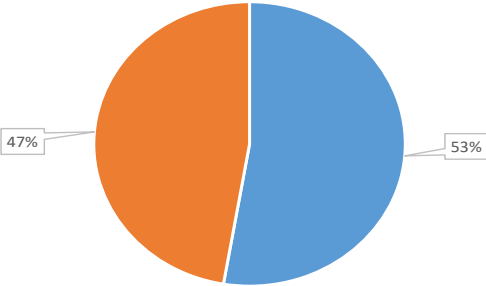
The household survey data shows plenty of opportunity for expansion with 30% of urban households still off-grid and only a quarter of rural households covered. This barely changed in the period 2010–2018.

There is a mix of high-, medium- and low-voltage lines in the national transmission network.

ENERGY NATIONAL FACT SHEET DJIBOUTI

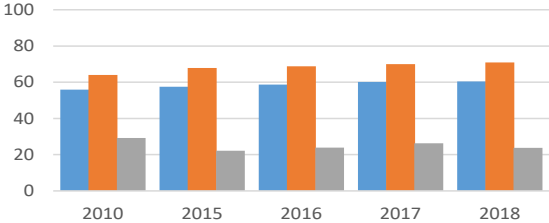
INDICATORS	2010	2015	2016	2017	2018	Charts
I. Capacity						
1. Installed Generation Capacity (MW)	...	123.0	123.0	123.0	123.0	
2. Generation capacity hydro-electric (MW)	...	-	-	-	-	
3. Generation capacity conventional thermal (MW)	...	123.0	123.0	123.0	123.0	
4. Generation capacity nuclear (MW)	
5. Generation capacity solar, wind, biomass, geothermal	
6. Operational Capacity (MW)	
7. Non-Operational Capacity (MW)	
8. Generation capacity of isolated (off grid) systems (MW)	
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	
10. Generation capacity of emergency generation (MW)	
II. Generation						
1. Total Generated (GWh)	325.0	363.9	373.2	569.6	585.7	
2. Imported (GWh)	...	314.3	449.5	508.2	526.0	
3. Exported (GWh)	
III. Transmission						
1. HV transmission: length (Km)	418.6	
2. HV tranmission in need of rehabilitation: length (Km)	
3. MV transmission: length (Km)	399.0	
4. MV transmission in need of rehabilitation: length (Km)	
5. LV transmission: length (Km)	640.0	
IV. Access to electricity						
1. National (% of population)	56.0	57.5	58.7	60.2	60.4	
2. Urban (% of urban population)	63.9	67.9	68.8	70.0	70.8	
3. Rural (% of rural population)	29.2	22.1	23.9	26.3	23.8	
V. Regulatory						
1. Sector Specific: De Jure Unbundling Generation-Transmission	
2. Sector Specific: De facto Unbundling Generation-Transmission	
3. Sector Specific: De Jure Unbundling Distribution-Transmission	
4. Sector Specific: De Facto Unbundling Distribution-Transmission	
5. Sector Specific: De Jure Unbundling Generation-Distribution	
6. Sector Specific: De facto Unbundling Generation-Distribution	
7. Reform: Number of Operators Generation	
8. Reform: Number of Operators Transmission	
9. Reform: Number of Operators Distribution	
10. Sector Specific: Minimum quality standards	
11. Sector Specific: Penalties for non Compliance	
12. Sector Specific: Cut off possibility	
13. Sector Specific: Renewable energy	
14. Reform: Market Model	

Generated vs. Imported Electricity: 2018



■ Generated (GWh) ■ Imported (GWh)

Electricity access



■ National (% of population)
■ Urban (% of urban population)
■ Rural (% of rural population)

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Ethiopia

National Level

Ethiopia more than doubled its total national energy capacity between 2010 and 2018; from 2,042 MW to 4,369 MW. During that period, the country managed to turn around its problem of capacity availability; in 2010, less than half was operational, versus 95% in 2018. Total electricity generated domestically is more complicated, however, with a near tripling of supply from 2010 to 2015 but with very modest increases from 2016–2018. Overall, production reached 12,212 GWh by 2018. A small portion of generation (almost 8%) was exported in 2018, to Djibouti and Sudan.

Renewable sources of energy are increasing. Hydroelectric generation capacity has more than doubled, while sources such as wind, solar, etc. accounted for 10% of the total generation capacity in 2018. Thermal capacity had nearly disappeared by 2018.

National household survey data shows a 50% improvement in coverage from 2010–2018, with almost all of the improvement in the rural areas. Nonetheless, there is significant room for improvement, as in 2018 two-thirds of the rural population were not covered by the grid; this equates to more than half of all households.

There is little reported data on the national transmission network.

For investors, the regulatory environment is mixed:

- For providers of renewable electricity supplies, there are incentives to promote such installations. Investors may identify off-grid household or larger grid supply opportunities.
- Generally, for suppliers to the grid, the opportunities to launch an independent power provider are present although other barriers to establish such may exist. Transmission and publicly owned suppliers are consolidated under Ethiopian Electric Power

Utility Level

Information about the monopoly power distribution company is sparse. Ethiopian Electric Utility (EEU) has some opportunities to grow outside the urban areas. The actual customer level (3.1 million at 2018), is more than double that of 2010.

Like many utilities on the continent, EEU operates with significant inefficiencies. System losses from transmission and distribution, as well as unbilled supply, total 30%.

Labor productivity in the period 2010–2018, in terms of volumes sold, improved by more than a factor of three, but at 1,076 MWh per employee it remains at the low end for the region.



ENERGY NATIONAL FACT SHEET ETHIOPIA

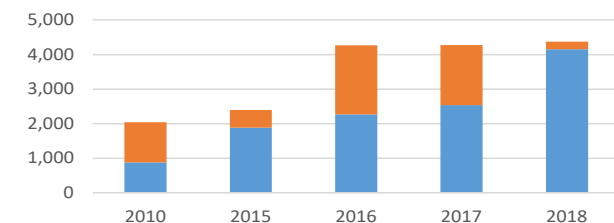
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	2,042.8	2,394.8	4,264.8	4,271.4	4,369.0
2. Generation capacity hydro-electric (MW)	1,848.8	1,943.8	3,813.8	3,820.4	3,814.0
3. Generation capacity conventional thermal (MW)	187.0	120.0	120.0	120.0	99.0
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	7.0	331.0	331.0	331.0	456.0
6. Operational Capacity (MW)	882.0	1,889.0	2,270.0	2,540.0	4,151.0
7. Non-Operational Capacity (MW)	1,160.8	505.8	1,994.8	1,731.4	218.0
8. Generation capacity of isolated (off grid) systems (MW)	...	...	...	...	...
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	...	...	...	...	...
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	3,579.0	10,437.0	11,168.8	11,660.8	12,212.3
2. Imported (GWh)	...	...	...	...	...
3. Exported (GWh)	...	761.9	165.8	190.7	968.0
III. Transmission					
1. HV transmission: length (Km)	7.0	13.1	13.2	13.5	4.8
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	3.0	2.0	2.0	2.1	13.8
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	...	...	...	...	...
IV. Access to electricity					
1. National (% of population)	33.2	29.0	42.9	44.3	45.0
2. Urban (% of urban population)	85.5	85.0	85.4	96.6	92.0
3. Rural (% of rural population)	22.2	15.5	32.4	31.0	32.7
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
4. Sector Specific: De Facto Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	1	1	1	1	1
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	1	1	1	1	1
10. Sector Specific: Minimum quality standards	no	no	no	no	no
11. Sector Specific: Penalties for non Compliance	no	no	no	no	no
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly	Integrated Monopoly

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

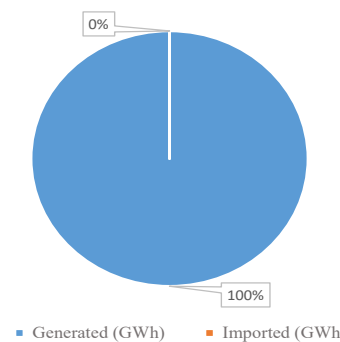
Charts

Operational vs. Non-Operational Capacity



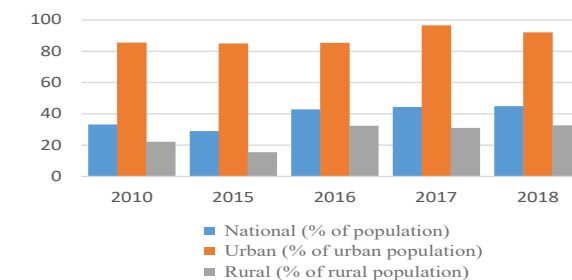
■ Operational Capacity (MW) ■ Non-Operational Capacity (MW)

Generated vs. Imported Electricity: 2018



■ Generated (GWh) ■ Imported (GWh)

Electricity access



■ National (% of population)
■ Urban (% of urban population)
■ Rural (% of rural population)



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: ETHIOPIA
UTILITY NAME: EEU- Ethiopia Electric Utility

INDICATORS	2010	2015	2016	2017	2018	Charts												
						<div><h3>Customers</h3><table><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2010</td><td>1,413.0</td></tr><tr><td>2015</td><td>2,058.5</td></tr><tr><td>2016</td><td>2,181.5</td></tr><tr><td>2017</td><td>2,439.9</td></tr><tr><td>2018</td><td>3,109.3</td></tr></tbody></table></div>	Year	Customers ('000)	2010	1,413.0	2015	2,058.5	2016	2,181.5	2017	2,439.9	2018	3,109.3
Year	Customers ('000)																	
2010	1,413.0																	
2015	2,058.5																	
2016	2,181.5																	
2017	2,439.9																	
2018	3,109.3																	
I. Access (number of customers, '000)																		
1. Total actual customers of which:	1,413.0	2,058.5	2,181.5	2,439.9	3,109.3													
- Low voltage customers													
- Medium voltage customers													
- High voltage customers													
2. Potential additional customers													
II. Financial																		
1. Billing of electricity (Birr, billion)													
2. Operational Costs (Birr, billion)	2.1	4.8	4.7	5.3	1.9													
3. Hidden costs (Birr, billion)													
4. Average effective tariff (Birr/Kwh)													
III. Technical																		
1. Electricity sold, volume (GWh)	2,873.0	6,442.0	5,960.0	7,469.0	8,585.0													
2. Electricity generated, volume (GWh)	3,682.9	8,691.4	9,459.5	10,412.5	12,388.7													
3. System losses (% electricity generated) Of which:													
- Distribution losses (%)													
- Transmission losses (%)													
4. Employees (number)	12,292.0	12,054.0	12,054.0	12,055.0	11,509.0													
5. Labor productivity (MWh/employee)	299.6	721.0	784.8	863.8	1,076.4													

Operational Costs

Year	Operational Costs (Birr, billion)
2010	2.1
2015	4.8
2016	4.7
2017	5.3
2018	1.9

Operational Costs (Birr, billion)

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.



Country Report – Kenya

National Level

Kenya grew its energy capacity massively between 2010 and 2018. In 2018 its total energy capacity (2,684 MW) was 82% higher than in 2010. However, the total electricity generated domestically during that period increased at only half that rate (42%), from 7,467 to 10,598 GWh. In 2018 a small generation shortfall (net of exports) of 95 GWh was met by imports representing less than 1% of the total supply before transmission and distribution.

Reflecting a global trend, renewable sources of energy are outpacing the growth of traditional thermal power generation in Kenya. Between 2010 and 2018, hydro-electric power capacity increased slightly. However, during that same period wind, solar, biomass and geothermal sources increased from 15% to 40% of total capacity. Thermal capacity slightly declined in absolute terms between 2015 and 2018.

The growth in supply is reflected in the household survey data, which indicates a dramatic increase in the proportion of households supplied with electricity, especially in rural areas. Overall, access has grown to 85%, with coverage in rural areas increasing from 7% in 2010 to over 70% in 2018. Since load-shedding information has not been supplied, it is not clear why the capacity of the system has grown so much faster than the actual supply; this warrants further investigation.

The national transmission network seems to have expanded at rates that reflect the increasingly rural focus of the national grid. High-voltage transmission from the new power sources doubled from 2010 to 2018, while low-voltage transmission increased by a factor of four. While no part of the transmission system is reported to be in need of rehabilitation, this is a more likely scenario for the newer low-voltage portion than the rest. Experience suggests that a systematic physical inventory of the transmission system would yield a substantially larger investment opportunity than is apparent at first sight.

For investors, the regulatory environment is variable:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural areas; which presents an interesting area for renewable providers.
- For suppliers to the grid, the opportunities to launch an independent power provider have been proven, with 17 suppliers operating as of 2018.
- On the side of local distribution, there seems to be a permissive regulatory environment for competition, although no competitors were operating in 2018. There may be other barriers to entry, non-specific to the industry, which are not being reported here.

Utility Level

The incumbent power provider, Kenya Power and Lighting Company (KPLC) has significant opportunities to grow and upgrade its grid. The number of its customers (6.8 million) in 2018 represents only 75% of the listed potential customers who could be served; this aligns with the urban household survey data at the national level. However, while growth in the number of customers connected rose quickly from 2010 to 2015, growth slowed considerably after that. Meanwhile, revenue growth



contracted to an even greater extent, presumably as the network was extended to lower-demand areas.

Like many utilities on the continent, KPLC operates with significant inefficiencies. System losses from transmission and distribution total 20%, whereas an efficient producer would run with losses of about 5–7%. In addition, there are implied losses from unbilled electricity provision, which account for a further 3.5% of generated electricity. Together, these show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability with hidden costs that totaled 28% of revenue in 2018. (KPLC reporting attributes all of these losses to the transmission network, which cannot be correct.) While investment in the transmission and distribution network will yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

Labor productivity at KPLC (MWh per employee) barely improved (6%) over the period 2010–2018.



ENERGY NATIONAL FACT SHEET KENYA

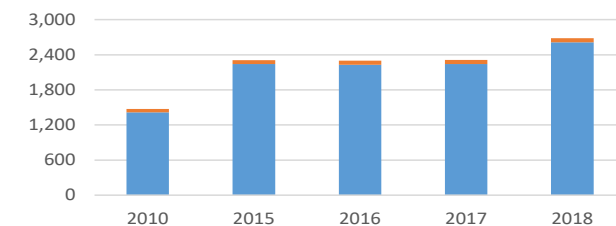
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	1,473.0	2,307.1	2,299.0	2,311.9	2,683.7
2. Generation capacity hydro-electric (MW)	758.0	820.4	818.7	826.2	826.2
3. Generation capacity conventional thermal (MW)	491.0	833.6	801.6	806.9	807.7
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	224.0	653.1	678.7	678.8	1,049.8
6. Operational Capacity (MW)	1,416.0	2,241.8	2,230.6	2,240.9	2,614.3
7. Non-Operational Capacity (MW)	57.0	65.3	68.4	71.0	69.4
8. Generation capacity of isolated (off grid) systems (MW)	...	...	...	...	...
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	17.0	19.0	19.0	27.0	31.6
10. Generation capacity of emergency generation (MW)	60.0	30.0	30.0	0.0	0.0
II. Generation					
1. Total Generated (GWh)	7,467.0	9,651.0	9,752.9	10,359.1	10,597.6
2. Imported (GWh)	30.0	58.8	86.3	229.6	130.3
3. Exported (GWh)	29.6	46.7	39.1	12.3	35.2
III. Transmission					
1. HV transmission: length (Km)	43,494.0	59,322.0	68,396.0	73,940.0	80,897.0
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	...	...	...	...	...
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	39,297.0	...	110,778.0	139,642.0	152,803.0
IV. Access to electricity					
1. National (% of population)	19.2	41.6	65.4	63.6	75.0
2. Urban (% of urban population)	58.2	78.1	77.6	81.0	84.0
3. Rural (% of rural population)	7.2	29.0	61.1	57.3	71.7
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	yes	yes	yes	yes	yes
2. Sector Specific: De facto Unbundling Generation-Transmission	yes	yes	yes	yes	yes
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	8	14	14	14	17
8. Reform: Number of Operators Transmission	2	2	2	2	2
9. Reform: Number of Operators Distribution	1	1	1	1	1
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

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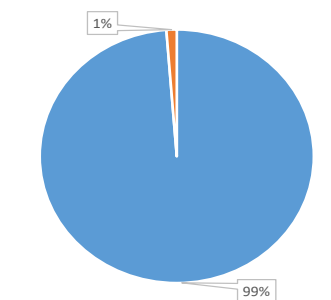
Charts

Operational vs. Non-Operational Capacity



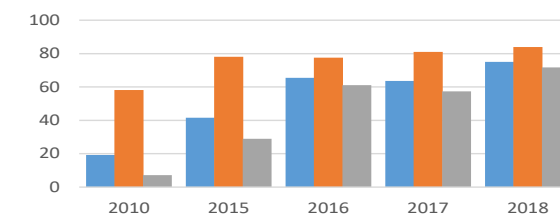
■ Operational Capacity (MW) ■ Non-Operational Capacity (MW)

Generated vs. Imported Electricity: 2018



■ Generated (GWh) ■ Imported (GWh)

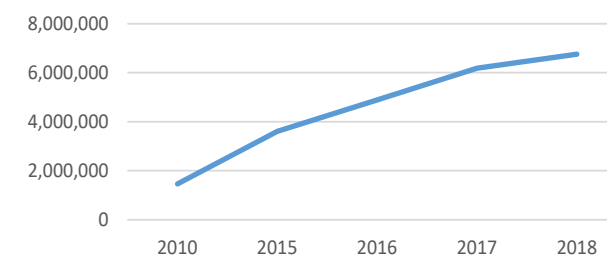
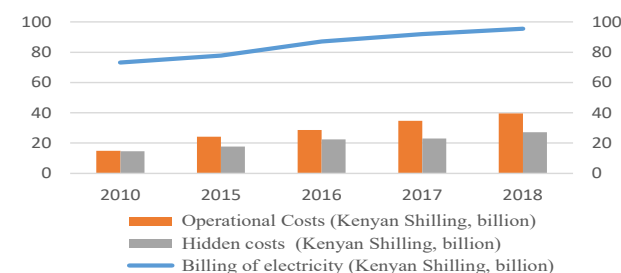
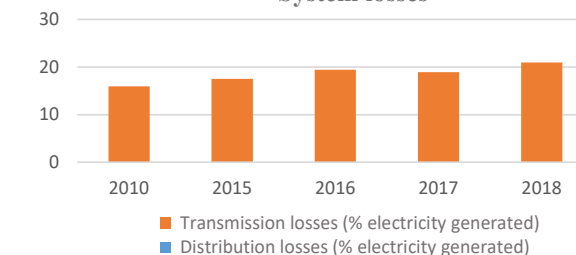
Electricity access



■ National (% of population)
 ■ Urban (% of urban population)
 ■ Rural (% of rural population)

ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: KENYA
UTILITY NAME: KPLC- Kenya Power and Lighting Company

INDICATORS	2010	2015	2016	2017	2018
I. Access (number of customers, '000)					
1. Total actual customers of which:	1,460.9	3,611.9	4,890.4	6,182.3	6,761.1
- Low voltage customers	1,458.2	3,608.5	4,886.8	6,178.6	6,757.2
- Medium voltage customers	2.7	3.3	3.5	3.6	3.8
- High voltage customers	0.0	0.1	0.1	0.1	0.1
2. Potential additional customers	250.0	250.0	250.0	250.0	250.0
II. Financial					
1. Billing of electricity (Kenyan Shilling, billion)	73.2	77.8	87.1	92.0	95.5
2. Operational Costs (Kenyan Shilling, billion)	14.9	24.2	28.7	34.7	39.6
3. Hidden costs (Kenyan Shilling, billion)	14.6	17.7	22.5	23.0	27.1
4. Average effective tariff (Kenyan Shilling/Kwh)	13.7	10.9	11.8	11.9	12.1
III. Technical					
1. Electricity sold, volume (GWh)	5,345.0	7,130.0	7,385.0	7,717.0	7,905.0
2. Electricity generated, volume (GWh)	6,692.0	9,280.0	9,817.0	10,205.0	10,702.0
3. System losses (% electricity generated) Of which:	16.0	17.5	19.4	18.9	21.0
- Distribution losses (%)	0.0	0.0	0.0	0.0	0.0
- Transmission losses (%)	16.0	17.5	19.4	18.9	21.0
4. Employees (number)	7,279.0	10,845.0	11,133.0	11,295.0	10,993.0
5. Labor productivity (MWh/employee)	919.4	855.7	881.8	903.5	973.5

Customers**Operational vs. Hidden Costs****System losses**

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

Country Report – Lesotho

National Level

Lesotho has had no change in its national energy capacity between 2010 and 2018; its 2018 total capacity remained at 75 MW, almost entirely hydropower. However, total electricity generated domestically has fallen over the decade by 25% to 530 GWh in 2018. With less than 5% of capacity reported as non-operational, the reason for the decline is not clear. The generation shortfall has been met by imports (385 GWh as of 2018), representing 42% of total supply in that year.

Despite no significant change in the total supply of electricity the household survey data indicates that the proportion of households supplied with electricity has increased significantly in the nation, especially in the rural areas. Overall, availability has grown to 47%, with the rural areas showing coverage growing from only 5% to 38% in 2018. Since load shedding information has not been supplied, it is not certain, but seems likely, that with no growth in total supply while the reach of the system has grown means that shortages must be occurring.

For investors, the regulatory environment is not friendly:

- For providers of renewable electricity supplies, there are no incentives to promote such installations.
- There is no competition in supply or distribution.

Utility Level

The monopoly incumbent power provider, Lesotho Electric Company (LEC) has significant opportunities to grow and to upgrade its grid. The actual customers (250,000) as at 2018, represents a little less than half of the potential customers who could be served according to the national household survey data. Growth in numbers of customers connected rose slowly but steadily over the decade. Meanwhile, revenue growth has increased dramatically (600+%), despite volumes only rising slowly. Like many utilities on the continent, LEC operates with significant inefficiencies. System losses from transmission and distribution have stayed above 20% from 2015-2018, whereas an efficient producer would run with losses of about 5-7%. These show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability as a significant share of revenue. While investment in the transmission and distribution network might yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

ENERGY NATIONAL FACT SHEET LESOTHO

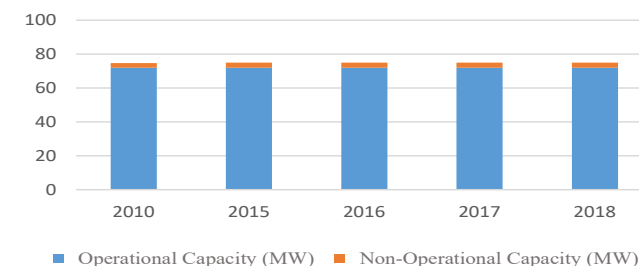
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	74.8	75.1	75.1	75.1	75.1
2. Generation capacity hydro-electric (MW)	74.8	74.8	74.8	74.8	74.8
3. Generation capacity conventional thermal (MW)	0.8	0.8	0.8	0.8	0.8
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	...	0.3	0.3	0.3	0.3
6. Operational Capacity (MW)	72.0	72.0	72.0	72.0	72.0
7. Non-Operational Capacity (MW)	2.8	3.1	3.1	3.1	3.1
8. Generation capacity of isolated (off grid) systems (MW)	...	...	...	...	...
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	...	...	...	...	...
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	694.0	402.0	419.6	507.8	530.2
2. Imported (GWh)	200.7	260.6	372.6	386.9	385.1
3. Exported (GWh)	5.5	4.4	2.6	0.8	2.9
III. Transmission					
1. HV transmission: length (Km)	...	...	...	...	1,339.2
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	...	...	...	...	...
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	...	...	...	...	...
IV. Access to electricity					
1. National (% of population)	17.0	31.8	35.3	33.7	47.0
2. Urban (% of urban population)	53.5	64.1	66.4	68.4	70.7
3. Rural (% of rural population)	4.9	19.9	23.6	20.4	37.7
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	yes	yes	yes	yes	yes
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	2	2	2	2	2
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	2	2	2	2	2
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	no	no	no	no	no
14. Reform: Market Model	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

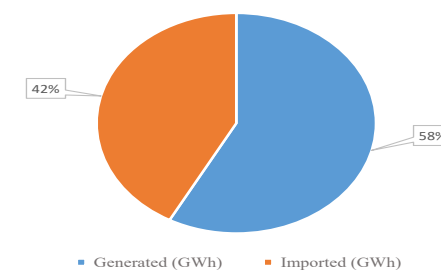
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Charts

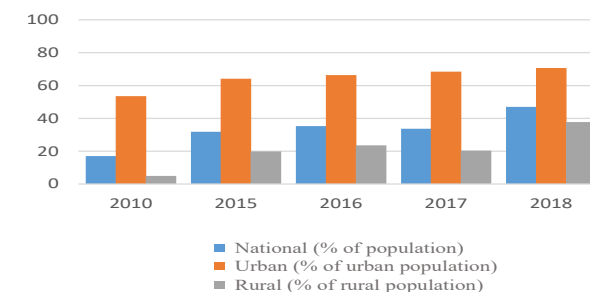
Operational vs. Non-Operational Capacity



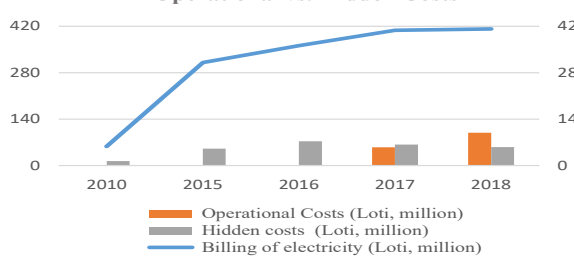
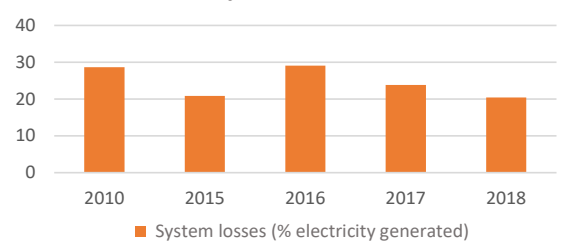
Generated vs. Imported Electricity: 2018



Electricity access



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: LESOTHO
UTILITY NAME: LEC- Lesotho Electricity Company

INDICATORS	2010	2015	2016	2017	2018	Charts
						<div>Customers</div>  <div>Operational vs. Hidden Costs</div>  <div>System losses</div> 
I. Access (number of customers, '000)						
1. Total actual customers of which:	105.5	203.8	219.4	233.7	250.2	
- Low voltage customers	...	...	...	...	...
- Medium voltage customers	...	...	...	...	...
- High voltage customers	...	...	...	...	...
2. Potential additional customers	...	...	...	...	...
II. Financial						
1. Billing of electricity (Kenyan Shilling, billion)	57.6	310.7	362.1	408.2	412.5	
2. Operational Costs (Kenyan Shilling, billion)	...	...	...	54.8	98.8
3. Hidden costs (Kenyan Shilling, billion)	13.6	51.1	73.2	63.1	55.5	
4. Average effective tariff (Kenyan Shilling/kWh)	9.5	46.0	49.6	53.0	52.7	
III. Technical						
1. Electricity sold, volume (GWh)	605.5	675.8	729.8	770.9	783.4	
2. Electricity generated, volume (GWh)	500.6	532.2	507.7	501.0	515.8	
3. System losses (% electricity generated) Of which:	28.6	20.9	29.1	23.8	20.4	
- Distribution losses (%)	...	...	...	...	...
- Transmission losses (%)	...	...	...	...	...
4. Employees (number)	494.0	505.0	515.0	488.0	501.0	
5. Labor productivity (MWh/employee)	1,013.3	1,053.8	985.9	1,026.6	1,029.5	

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Madagascar

National Level

Madagascar doubled its nominal national grid energy capacity between 2010 and 2017 to 844 MW. However, only two-thirds of that capacity is operational. Similarly, its off-grid systems, which account for 30% of total capacity, had the same rate actually operational. Corresponding to this growth in capacity is a doubling in total actual generation to 2,650 GWh by 2015, although this has remained stagnant since 2015. The island nation neither exports nor imports any power.

Virtually all the growth in capacity has been in traditional thermal generation. However, as of 2018, 20% of its capacity was still hydropower based.

The household survey data indicates that the proportion of households supplied with electricity has barely changed in the nation as a whole. Urban inclusion by the grid has inched upwards by 10%, while rural areas have remained completely unconnected. This supports the view that growth in supply has been absorbed by existing households and establishments. Under-supply has been eased, but those who were off the grid in 2010 largely remain so.

The national transmission network seems to have grown in line with generation. High-voltage transmission from the new power sources doubled in the period 2010–2018 to almost 600 km. While no part of the transmission system is reported to be in need of rehabilitation, this seems highly unlikely given the age of the system and the level of transmission system losses reported at the largest utility. Experience suggests that a systematic physical inventory of the transmission system would yield a substantially larger investment opportunity than is immediately apparent. As the grid extends into more rural areas, the need for investment in transmission will also increase.

For investors, the regulatory environment is variable:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural areas; this is an interesting area for renewable providers.
- For suppliers to a grid, the opportunities to launch an independent power provider have been proven, with 149 suppliers to 100 distributors, as of 2017. Nonetheless, 70% of electricity is provided by a single provider: JIRAMA.
- On the side of local distribution, there are many providers, although it seems unlikely that they compete in the same market. The various towns appear to be supplied by a multitude of small providers.

Utility Level

The largest power provider, Jiro Sy Rano Malagasy (JIRAMA) has significant opportunities to grow and to upgrade its grid. Its half million customers, as at 2017, represent only a third of those who could potentially be served. Based on the evidence of the household survey, this implies that JIRAMA has a significant rural population in its service area.

Electricity revenue has risen by 75%, far faster than the increase in actual volume growth, which has remained at 35%.

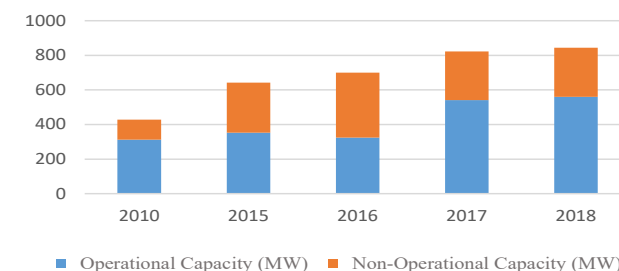
Like many utilities in the region, JIRAMA operates with significant inefficiencies. System losses from transmission and distribution total 33%, whereas an efficient producer would run with losses of about 5–7%. These show up as “hidden costs” or lost revenue opportunities. This burden on the firm’s opportunity for profitability was equivalent to half of its electricity revenue in 2018. Given the generation capacity that is currently non-operational, the opportunity for investment in improving the network and repairing capacity is likely to yield a high return. Non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system. In volume terms, the labor productivity of JIRAMA is one of the lowest in the region at only 289 MWh per employee.

ENERGY NATIONAL FACT SHEET MADAGASCAR

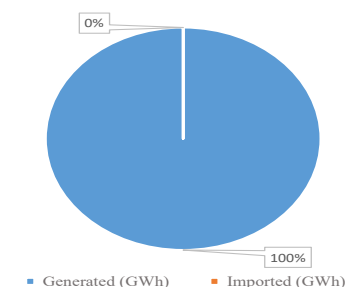
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	428.0	641.9	699.7	823.1	843.7
2. Generation capacity hydro-electric (MW)	131.6	162.0	162.0	168.9	169.0
3. Generation capacity conventional thermal (MW)	296.4	479.9	537.7	653.2	653.7
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	8.3	0.0	0.0	0.0	1.0
6. Operational Capacity (MW)	312.5	352.4	324.5	541.1	559.8
7. Non-Operational Capacity (MW)	115.6	289.5	375.2	282.0	283.9
8. Generation capacity of isolated (off grid) systems (MW)	118.0	198.3	215.7	221.7	245.6
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	73.6	82.8	97.9	107.4	116.2
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	1,189.0	2,650.0	2,738.4	2,255.4	2,437.8
2. Imported (GWh)	0.0	0.0	0.0	0.0	0.0
3. Exported (GWh)	0.0	0.0	0.0	0.0	0.0
III. Transmission					
1. HV transmission: length (Km)	276.0	598.0	598.0	598.0	598.0
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	56.0	56.0	56.0	56.0	56.0
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	...	...	...	...	...
IV. Access to electricity					
1. National (% of population)	17.6	20.2	22.9	24.1	25.9
2. Urban (% of urban population)	60.1	66.1	67.3	68.4	69.6
3. Rural (% of rural population)	...	...	...	...	0.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	yes	yes	yes	yes	yes
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	61	108	115	115	149
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	55	93	98	98	100
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"non applicable"	non applicable	non applicable	non applicable	non applicable

Charts

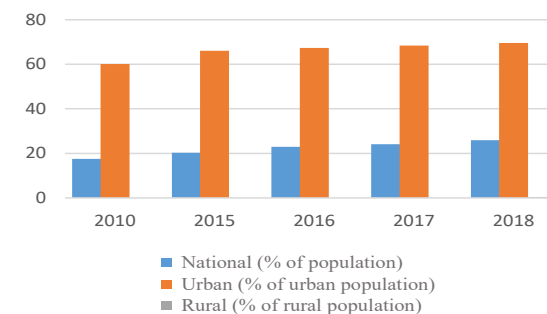
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



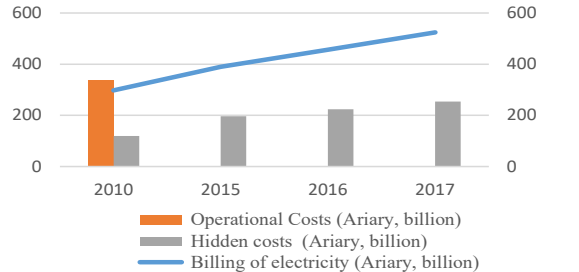
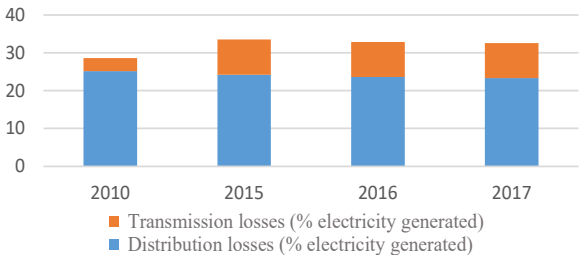
Electricity access



Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: MADAGASCAR
UTILITY NAME: JIRAMA- Jiro sy Rano Malagasy

INDICATORS	2010	2015	2016	2017	2018	<div>Charts</div> <div><div>Customers</div><div>Operational vs. Hidden Costs</div><div>System losses</div></div>
I. Access (number of customers, '000)						
1. Total actual customers of which:	423.2	480.4	498.5	507.8	...	
- Low voltage customers	422.2	479.3	497.3	506.6	...	
- Medium voltage customers	0.9	1.1	1.1	1.2	...	
- High voltage customers	0.0	0.0	0.0	0.0	...	
2. Potential additional customers	1,987.6	1,892.2	1,678.3	1,599.3	...	
II. Financial						
1. Billing of electricity (Ariary, billion)	297.4	389.5	456.5	524.0	...	
2. Operational Costs (Ariary, billion)	338.7	...	...	...	...
3. Hidden costs (Ariary, billion)	119.1	196.7	223.7	253.5	...	
4. Average effective tariff (Ariary/kwh)	350.0	380.1	412.0	456.9	...	
III. Technical						
1. Electricity sold, volume (GWh)	849.6	1,024.7	1,108.0	1,146.9	...	
2. Electricity generated, volume (GWh)	1,189.8	1,542.2	1,651.0	1,701.6	...	
3. System losses (% electricity generated) Of which:	28.6	33.6	32.9	32.6	...	
- Distribution losses (%)	25.2	24.2	23.6	23.3	...	
- Transmission losses (%)	3.4	9.4	9.3	9.3	...	
4. Employees (number)	5,937.0	5,926.0	5,953.0	5,891.0	...	
5. Labor productivity (MWh/employee)	200.4	260.2	277.3	288.8	...	

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



Country Report – Malawi

Very few data were available for Malawi; consequently it is very difficult to draw any conclusions. The available data are presented in the charts and tables that follow.



ENERGY NATIONAL FACT SHEET MALAWI

INDICATORS	2010	2015	2016	2017	2018	Charts
I. Capacity						
1. Installed Generation Capacity (MW)	
2. Generation capacity hydro-electric (MW)	
3. Generation capacity conventional thermal (MW)	
4. Generation capacity nuclear (MW)	
5. Generation capacity solar, wind, biomass, geothermal	
6. Operational Capacity (MW)	
7. Non-Operational Capacity (MW)	
8. Generation capacity of isolated (off grid) systems (MW)	
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	
10. Generation capacity of emergency generation (MW)	
II. Generation						
1. Total Generated (GWh)	1,943.0	2,681.1	2,724.8	2,771.1	2,819.9	
2. Imported (GWh)	
3. Exported (GWh)	20.5	21.9	24.4	20.4	82.2	
III. Transmission						
1. HV transmission: length (Km)	
2. HV tranmission in need of rehabilitation: length (Km)	
3. MV transmission: length (Km)	
4. MV transmission in need of rehabilitation: length (Km)	
5. LV transmission: length (Km)	
IV. Access to electricity						
1. National (% of population)	8.7	10.8	11.0	12.7	18.0	
2. Urban (% of urban population)	34.7	48.7	42.0	57.5	55.2	
3. Rural (% of rural population)	3.9	3.4	4.9	3.7	10.4	
V. Regulatory						
1. Sector Specific: De Jure Unbundling Generation-Transmission	
2. Sector Specific: De facto Unbundling Generation-Transmission	
3. Sector Specific: De Jure Unbundling Distribution-Transmission	
4. Sector Specific: De Facto Unbundling Distribution-Transmission	
5. Sector Specific: De Jure Unbundling Generation-Distribution	
6. Sector Specific: De facto Unbundling Generation-Distribution	
7. Reform: Number of Operators Generation	
8. Reform: Number of Operators Transmission	
9. Reform: Number of Operators Distribution	
10. Sector Specific: Minimum quality standards	
11. Sector Specific: Penalties for non Compliance	
12. Sector Specific: Cut off possibility	
13. Sector Specific: Renewable energy	
14. Reform: Market Model	

Generated vs. Imported Electricity: 2018

0% 100%

Generated (GWh) Imported (GWh)

Electricity access

2010 2015 2016 2017 2018

National (% of population)
Urban (% of urban population)
Rural (% of rural population)

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Mozambique

National Level

Mozambique is a study in power sector contrasts. The nation sells power across southern Africa, with hydropower accounting for 78% of its total generation capacity (2,827 MW) in 2018. Additional generational capacity (23%) was added in the period 2010–2018, and this was equally divided between thermal and hydroelectric sources. However, the total amount of operational capacity since 2010 has actually fallen by 22% to 1,200 MW. Corresponding to this stagnation in operational capacity is a relatively flat total actual power generation, averaging 18,051 GWh over the period 2015–2018.

While Mozambican power is sold across southern Africa directly and through the Southern African Power Pool (totaling 10,446 GWh in 2018), the country imports nearly as much as it sells (9,899 GWh in 2018).

The household survey data indicates that the proportion of households supplied with electricity has grown modestly in the nation as a whole since 2010. Urban inclusion by the grid has risen by 17%, while rural areas have remained almost wholly (92%) unserved. With more households and businesses served by the national grid and the leveling off of supply, the number of power outages must have increased.

There is little available information about the national transmission network, except to note that the high-voltage portion of the system did not expand from 2010–2018. Given the age of the system, the level of transmission system losses reported at the largest utility, and the long list of rehabilitation projects underway, it is likely that a substantial portion of the transmission and the distribution systems, are in need of rehabilitation.

For investors, the regulatory environment is highly restrictive:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for renewable sourced off-grid and isolated grid providers in the rural areas, as well as individual household and business supplies.
- For suppliers to a grid, the opportunities to launch an independent power provider or a competitive distribution supplier are prohibited by regulation.

Utility Level

EDM

The largest power distributor, Electricidade de Moçambique (EDM) has significant opportunities to grow and upgrade its grid. While its 2018 customer base of 1.9 million is more than doubled that of 2010, its potential customers have also more than doubled.

Total revenue rose from 2010 to 27 billion Meticals in 2017, although this was slightly lower than the peak in 2016. Without information on volumes, it is difficult to be certain, but it appears that revenues have stopped growing in line with available national generation.

Like many utilities in the region, EDM operates with significant inefficiencies. System losses from transmission and distribution totaled 22% for 2015 (the latest year for which data is available), whe-

reas an efficient producer would run with losses of about 5–7%. These show up as “hidden costs” or lost revenue opportunities. This burden on the firm’s opportunity for profitability was equivalent to one-third of its electricity revenue in 2015. Taking this into consideration along with the generation capacity that is currently non-operational, the opportunity for investment in network improvements and repairing capacity is likely to yield a high return. Non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

In volume terms, the labor productivity of EDM is in the lower-middle part of the range in the region at 1,567 MWh per employee as of 2015.

HCB

Hidroelectrica de Cahora Bassa (HCB) is a generation and transmission company. The firm witnessed a 29% decline in its sales of electricity from the 2015 level of 16,978 GWh down to 12,000 GWh in 2018. This is partly due to a decline in production and partly due to increased system losses, which have averaged 8% in the same period. Technical losses of 8% in transmission alone are high and speak to the age of the lines.

Although the utility-level reporting is not available, the national-level data makes it clear that the combination of increasing system losses and declining operational capacity is constricting the profitability of this enterprise. In addition, the tension between the need to supply regionally and the increasing domestic demands will only become more difficult to resolve without significant investment in HCB’s plant.

HCB’s labor productivity remains at a high level, although it declined by 30% from 26,521 MWh/employee in 2010 to 18,539 MWh/employee in 2018.

ENERGY NATIONAL FACT SHEET MOZAMBIQUE

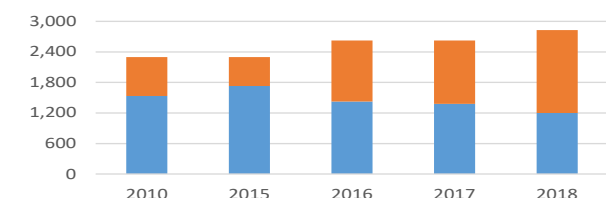
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	2,300.0	2,300.0	2,626.0	2,626.0	2,827.0
2. Generation capacity hydro-electric (MW)	2,185.0	2,185.0	2,185.0	2,216.0	2,216.0
3. Generation capacity conventional thermal (MW)	115.0	113.8	439.8	408.5	609.5
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	1.2	1.2	1.5	1.5
6. Operational Capacity (MW)	1,535.6	1,729.5	1,426.2	1,378.8	1,200.1
7. Non-Operational Capacity (MW)	764.4	570.5	1,199.8	1,247.2	1,626.9
8. Generation capacity of isolated (off grid) systems (MW)	...	1,350.0	1,350.0	1,350.0	1,350.0
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	...	1,350.0	1,350.0	1,350.0	1,350.0
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	16,658.0	19,105.4	18,733.2	16,992.5	17,373.0
2. Imported (GWh)	8,533.0	10,547.2	9,927.5	9,935.0	9,899.0
3. Exported (GWh)	12,075.0	12,876.0	14,269.3	9,945.0	10,446.0
III. Transmission					
1. HV transmission: length (Km)	5,475.0	5,559.0	5,559.0	5,559.0	5,660.0
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	...	...	...	...	...
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	10,384.0	...	...	...	...
IV. Access to electricity					
1. National (% of population)	18.0	24.0	27.7	29.3	31.1
2. Urban (% of urban population)	54.6	68.0	69.4	71.8	72.2
3. Rural (% of rural population)	0.9	0.9	5.3	5.9	8.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	no	no	no	no	no
7. Reform: Number of Operators Generation	2	2	2	2	2
8. Reform: Number of Operators Transmission	2	2	2	2	2
9. Reform: Number of Operators Distribution	1	1	1	1	1
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

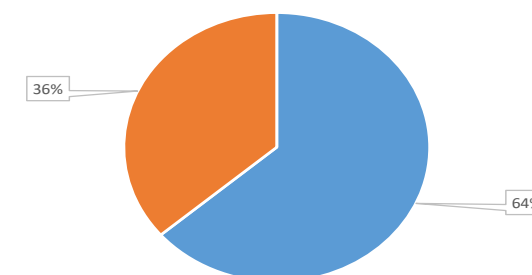
... : non available

Charts

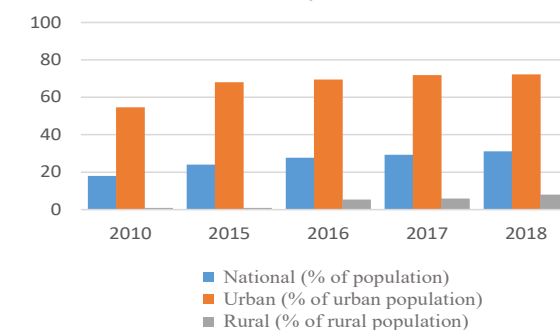
Operational vs. Non-Operational Capacity


■ Operational Capacity (MW)
■ Non-Operational Capacity (MW)

Generated vs. Imported Electricity: 2018


■ Generated (GWh)
■ Imported (GWh)

Electricity access


■ National (% of population)
■ Urban (% of urban population)
■ Rural (% of rural population)



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: MOZAMBIQUE
UTILITY NAME: EDM- Electricidade de Moçambique

INDICATORS	2010	2015	2016	2017	2018	Charts												
						<h3>Customers</h3> <table border="1"><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2010</td><td>858.1</td></tr><tr><td>2015</td><td>1,451.0</td></tr><tr><td>2016</td><td>1,447.3</td></tr><tr><td>2017</td><td>1,511.7</td></tr><tr><td>2018</td><td>1,641.2</td></tr></tbody></table>	Year	Customers ('000)	2010	858.1	2015	1,451.0	2016	1,447.3	2017	1,511.7	2018	1,641.2
Year	Customers ('000)																	
2010	858.1																	
2015	1,451.0																	
2016	1,447.3																	
2017	1,511.7																	
2018	1,641.2																	
I. Access (number of customers, '000)																		
1. Total actual customers of which:	858.1	1,451.0	1,511.7	1,641.2	1,890.5													
- Low voltage customers	855.9	1,447.3													
- Medium voltage customers	2.2	3.7													
- High voltage customers	0.0	0.0	0.0	0.0	0.0													
2. Potential additional customers	130.9	88.1	71.0	147.9	257.5													
II. Financial																		
1. Billing of electricity (New Metical, billion)	6.1	15.4													
2. Operational Costs (New Metical, billion)	1.2													
3. Hidden costs (New Metical, billion)	2.1	5.2													
4. Average effective tariff (New Metical/Kwh)	2.8	3.9													
III. Technical																		
1. Electricity sold, volume (GWh)	2,197.0	3,907.0													
2. Electricity generated, volume (GWh)	3,553.0	6,085.0													
3. System losses (% electricity generated) Of which:	21.1	21.6													
- Distribution losses (%)	17.0	15.5													
- Transmission losses (%)	4.1	6.1													
4. Employees (number)	3,511.0	3,883.0	3,339.0													
5. Labor productivity (MWh/employee)	1,012.0	1,567.1													

Operational vs. Hidden Costs

Year	Operational Costs (billion)	Hidden costs (billion)	Billing of electricity (billion)
2010	1.2	2.1	6.1
2015	...	5.2	15.4

System losses

Year	Distribution losses (%)	Transmission losses (%)	Total system losses (%)
2010	17.0	4.1	21.1
2015	15.5	6.1	21.6

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

'...' : non available



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: MOZAMBIQUE
UTILITY NAME: HCB- Hidroelétrica de Cahora Bassa

INDICATORS	2010	2015	2016	2017	2018	Charts																								
						<h3>High voltage customers</h3> <table><thead><tr><th>Year</th><th>2010</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th></tr></thead><tbody><tr><td>High voltage customers</td><td>3.0</td><td>3.0</td><td>3.0</td><td>3.0</td><td>3.0</td></tr></tbody></table>	Year	2010	2015	2016	2017	2018	High voltage customers	3.0	3.0	3.0	3.0	3.0												
Year	2010	2015	2016	2017	2018																									
High voltage customers	3.0	3.0	3.0	3.0	3.0																									
I. Access (number of customers, '000)																														
1. Total actual customers of which:																									
- Low voltage customers																									
- Medium voltage customers																									
- High voltage customers	3.0	3.0	3.0	3.0	3.0																									
2. Potential additional customers																									
						<h3>Operational vs. Hidden Costs</h3> <table><thead><tr><th>Year</th><th>Operational Costs (New Metical, billion)</th><th>Hidden costs (New Metical, billion)</th><th>Billing of electricity (New Metical, billion)</th></tr></thead><tbody><tr><td>2010</td><td>3.3</td><td>0.4</td><td>10.5</td></tr><tr><td>2015</td><td>1.6</td><td>1.0</td><td>12.9</td></tr><tr><td>2016</td><td>1.6</td><td>1.1</td><td>15.0</td></tr><tr><td>2017</td><td>2.0</td><td>1.2</td><td>15.6</td></tr><tr><td>2018</td><td>2.5</td><td>2.4</td><td>22.3</td></tr></tbody></table>	Year	Operational Costs (New Metical, billion)	Hidden costs (New Metical, billion)	Billing of electricity (New Metical, billion)	2010	3.3	0.4	10.5	2015	1.6	1.0	12.9	2016	1.6	1.1	15.0	2017	2.0	1.2	15.6	2018	2.5	2.4	22.3
Year	Operational Costs (New Metical, billion)	Hidden costs (New Metical, billion)	Billing of electricity (New Metical, billion)																											
2010	3.3	0.4	10.5																											
2015	1.6	1.0	12.9																											
2016	1.6	1.1	15.0																											
2017	2.0	1.2	15.6																											
2018	2.5	2.4	22.3																											
II. Financial																														
1. Billing of electricity (New Metical, billion)	10.5	12.9	15.0	15.6	22.3																									
2. Operational Costs (New Metical, billion)	3.3	1.6	1.6	2.0	2.5																									
3. Hidden costs (New Metical, billion)	0.4	1.0	1.1	1.2	2.4																									
4. Average effective tariff (New Metical/Kwh)	0.7	0.8	1.1	1.1	1.9																									
						<h3>System losses</h3> <table><thead><tr><th>Year</th><th>Transmission losses (% electricity generated)</th><th>Distribution losses (% electricity generated)</th></tr></thead><tbody><tr><td>2010</td><td>3.6</td><td>0.0</td></tr><tr><td>2015</td><td>8.8</td><td>0.0</td></tr><tr><td>2016</td><td>6.7</td><td>0.0</td></tr><tr><td>2017</td><td>7.7</td><td>0.0</td></tr><tr><td>2018</td><td>9.3</td><td>0.0</td></tr></tbody></table>	Year	Transmission losses (% electricity generated)	Distribution losses (% electricity generated)	2010	3.6	0.0	2015	8.8	0.0	2016	6.7	0.0	2017	7.7	0.0	2018	9.3	0.0						
Year	Transmission losses (% electricity generated)	Distribution losses (% electricity generated)																												
2010	3.6	0.0																												
2015	8.8	0.0																												
2016	6.7	0.0																												
2017	7.7	0.0																												
2018	9.3	0.0																												
III. Technical																														
1. Electricity sold, volume (GWh)	14,624.0	16,978.0	14,261.0	13,787.0	12,000.0																									
2. Electricity generated, volume (GWh)	17,000.0	15,287.0	15,574.0	13,787.1	13,700.0																									
3. System losses (% electricity generated) Of which:	3.6	8.8	6.7	7.7	9.3																									
- Distribution losses (%)	0.0	0.0	0.0	0.0	0.0																									
- Transmission losses (%)	3.6	8.8	6.7	7.7	9.3																									
4. Employees (number)	641.0	742.0	740.0	715.0	739.0																									
5. Labor productivity (MWh/employee)	26,521.1	20,602.4	21,045.9	19,282.7	18,538.6																									

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

'...' : non available



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: MOZAMBIQUE
UTILITY NAME: FUNAE- Fundo de Energia

INDICATORS	2010	2015	2016	2017	2018	Charts																						
						<div><h3>Customers</h3><table><thead><tr><th>Year</th><th>Customers ('000)</th></tr></thead><tbody><tr><td>2015</td><td>1.0</td></tr><tr><td>2016</td><td>2.0</td></tr><tr><td>2017</td><td>2.0</td></tr><tr><td>2018</td><td>2.0</td></tr></tbody></table></div> <div><h3>Operational Costs</h3><table><thead><tr><th>Year</th><th>Operational Costs (billion Metical)</th></tr></thead><tbody><tr><td>2010</td><td>0.1</td></tr><tr><td>2015</td><td>0.2</td></tr><tr><td>2016</td><td>0.1</td></tr><tr><td>2017</td><td>1.2</td></tr><tr><td>2018</td><td>0.1</td></tr></tbody></table><p>Operational Costs (New Metical, billion)</p></div>	Year	Customers ('000)	2015	1.0	2016	2.0	2017	2.0	2018	2.0	Year	Operational Costs (billion Metical)	2010	0.1	2015	0.2	2016	0.1	2017	1.2	2018	0.1
Year	Customers ('000)																											
2015	1.0																											
2016	2.0																											
2017	2.0																											
2018	2.0																											
Year	Operational Costs (billion Metical)																											
2010	0.1																											
2015	0.2																											
2016	0.1																											
2017	1.2																											
2018	0.1																											
I. Access (number of customers, '000)																												
1. Total actual customers of which:	...	1.0	2.0	2.0	2.0																							
- Low voltage customers	...	1.0	2.0	2.0	2.0																							
- Medium voltage customers																							
- High voltage customers																							
2. Potential additional customers	...	5.0	5.0	5.0	5.0																							
II. Financial																												
1. Billing of electricity (New Metical, billion)																							
2. Operational Costs (New Metical, billion)	0.1	0.2	0.1	1.2	0.1																							
3. Hidden costs (New Metical, billion)																							
4. Average effective tariff (New Metical/Kwh)																							
III. Technical																												
1. Electricity sold, volume (GWh)																							
2. Electricity generated, volume (GWh)	...	1,350.0	1,350.0	1,350.0	1,350.0																							
3. System losses (% electricity generated) Of which:																							
- Distribution losses (%)																							
- Transmission losses (%)																							
4. Employees (number)	120.0	257.0	264.0	260.0	261.0																							
5. Labor productivity (MWh/employee)	...	5,252.9	5,113.6	5,192.3	5,172.4																							

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Rwanda

National Level

Rwanda massively increased its national energy capacity between 2010 and 2018; its 2018 total capacity was 157% higher than in 2010 at 216 MW. Total electricity generated domestically more than doubled from 2010 to 2015 (from 84 MW to 182 MW) but since then remained virtually static. In 2018, total local generation was 554 GWh. Reliance on imported power also declined from 28% of supply to 5% from 2010 to 2018.

During this period, thermal sources capacity oscillated significantly, but in 2018 thermal power finally equaled capacity from hydroelectric sources at around 100 MW. Other sources were very minor, contributing little to total capacity.

The growth in supply is reflected in the household survey data, which indicates that the proportion of households supplied with electricity has increased dramatically in the nation. Urban access to electricity is close to ubiquitous, while the rural areas are show coverage growing from 2% to over 23% during the period 2010–2018.

When the steady growth in access and actual delivery are read together, the variability in capacity implies that a significant portion of capacity is not being used. It is not clear whether the installed capacity is non-operational or whether demand is low. Since load-shedding information has not been supplied, it is not clear what this gap implies and this warrants further investigation.

The national transmission network seems to have expanded at rates that reflect the increasingly rural focus of the national grid. High- and medium-voltage transmission from alternate power sources tripled in the period 2010 to 2018, while low-voltage transmission grew even faster (3.6 times). While no part of the transmission system is reported to be in need of rehabilitation, this is more likely to be the case in terms of the newer portion than the rest.

For investors, the regulatory environment is mixed:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural areas; an interesting area for renewable providers in addition to households.
- For suppliers to the grid, the opportunities to launch an independent power provider have been proven, with 34 suppliers as of 2018.
- On the side of transmission and local distribution, there seems to be a restricted regulatory environment for competition. There may also be other barriers to entry that are not specific to the industry not reported here.

Utility Level

The incumbent monopoly power provider, Energy Utility Corporation Limited (EUCL) has significant opportunities to grow and to upgrade its grid. Its number of customers (878,000) as at 2018, represented only 75% of the potential customers who could be served, according to the household survey data at the national level. However, while growth in the numbers of customers connected has risen steadily in the period 2010–2018, recent revenue growth has slowed considerably. This is likely

accounted for by the network stretching to lower average demand areas and suggests marginal revenue growth from expansion will be limited.

Like many utilities on the continent, EUCL operates with significant inefficiencies. System losses from transmission and distribution have averaged 21% (2015–2018), whereas an efficient producer would run with losses of about 5–7%. These losses show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability. In 2018, these were the equivalent of 25% of billed electricity revenue.

EUCL attributes a little under a half of its distribution losses as non-technical (unbilled, theft, etc.). Investment in the transmission and distribution network will yield significant returns in terms of technical losses.

In terms of electricity volume supplied, EUCL increased its labor productivity in the period 2010–2018 by an astonishing 454%, thus positioning the company among the leading electricity suppliers in Africa in this variable.

ENERGY NATIONAL FACT SHEET RWANDA

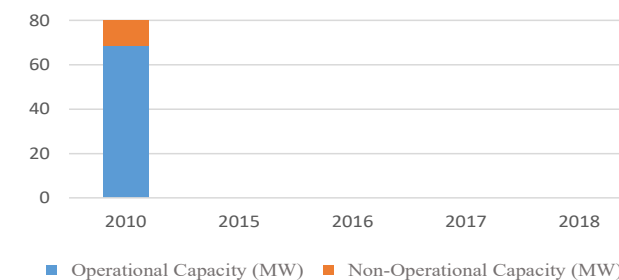
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	84.1	182.1	233.8	198.9	216.0
2. Generation capacity hydro-electric (MW)	51.4	81.5	85.5	96.8	100.5
3. Generation capacity conventional thermal (MW)	32.5	91.9	139.6	93.4	103.4
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.3	8.8	8.8	8.8	12.1
6. Operational Capacity (MW)	68.6	...	...	...	...
7. Non-Operational Capacity (MW)	15.5	...	...	...	...
8. Generation capacity of isolated (off grid) systems (MW)	0.6	...	...	...	...
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	0.6	...	...	...	...
10. Generation capacity of emergency generation (MW)	10.0	28.3	28.3	48.8	58.8
II. Generation					
1. Total Generated (GWh)	282.0	533.4	539.8	546.8	554.4
2. Imported (GWh)	79.8	87.2	73.3	44.9	29.5
3. Exported (GWh)	2.8	3.9	4.4	4.2	4.3
III. Transmission					
1. HV transmission: length (Km)	383.6	492.5	531.5	695.0	833.0
2. HV transmission in need of rehabilitation: length (Km)	70.0	...	...	...	...
3. MV transmission: length (Km)	1,847.0	4,578.0	5,163.2	5,397.2	6,443.4
4. MV transmission in need of rehabilitation: length (Km)	220.0	...	...	...	...
5. LV transmission: length (Km)	3,806.0	10,191.4	10,719.8	12,784.9	13,941.8
IV. Access to electricity					
1. National (% of population)	9.7	22.8	29.4	34.1	34.7
2. Urban (% of urban population)	44.5	72.9	80.0	84.8	89.1
3. Rural (% of rural population)	2.6	12.5	19.0	23.6	23.4
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	no	yes	yes	yes	yes
7. Reform: Number of Operators Generation	1	28	29	33	34
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	1	1	1	1	1
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

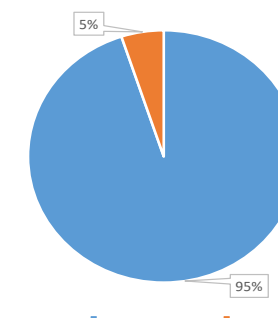
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Charts

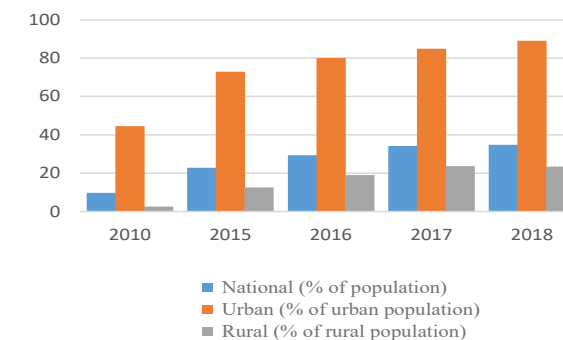
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



Electricity access

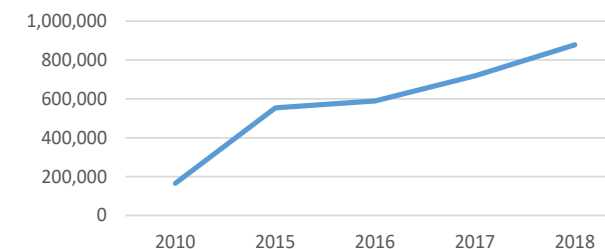




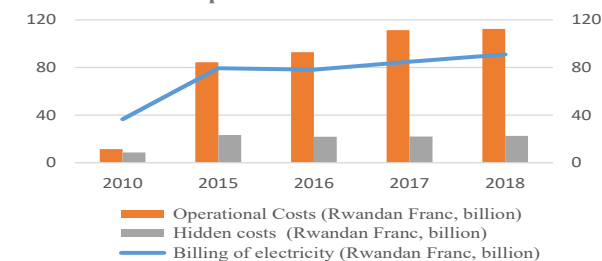
ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: RWANDA
UTILITY NAME: EUCL- Energy Utility Corporation Limited

INDICATORS	2010	2015	2016	2017	2018
I. Access (number of customers, '000)					
1. Total actual customers of which:	166.2	554.6	589.8	718.3	878.1
- Low voltage customers	165.5	549.0	584.0	712.4	869.3
- Medium voltage customers	0.7	5.5	5.9	6.0	8.8
- High voltage customers	0.0	0.0	0.0	0.0	0.0
2. Potential additional customers	...	...	...	...	...
II. Financial					
1. Billing of electricity (Rwandan Franc, billion)	36.6	79.3	78.1	84.9	91.0
2. Operational Costs (Rwandan Franc, billion)	11.5	84.4	92.9	111.4	112.4
3. Hidden costs (Rwandan Franc, billion)	8.7	23.3	21.8	22.0	22.5
4. Average effective tariff (Rwandan Franc/Kwh)	128.0	167.85	143.43	141.40	138.28
III. Technical					
1. Electricity sold, volume (GWh)	285.6	472.7	544.5	600.1	658.2
2. Electricity generated, volume (GWh)	353.2	610.9	689.6	750.1	819.9
3. System losses (% electricity generated) Of which:	19.1	22.7	22.0	20.8	19.9
- Distribution losses (%)	15.3	17.8	17.3	16.6	15.5
- Transmission losses (%)	3.8	4.9	4.8	4.2	4.4
4. Employees (number)	928.0	574.0	495.0	416.0	389.0
5. Labor productivity (MWh/employee)	380.6	1,064.3	1,393.2	1,803.2	2,107.7

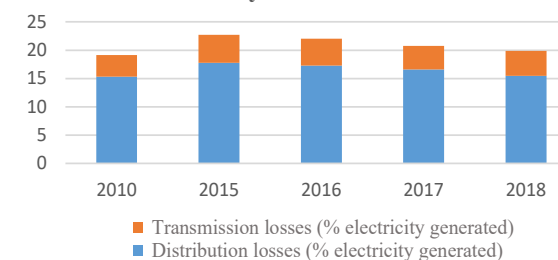
Customers



Operational vs. Hidden Costs



System losses



Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

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Country Report – Sudan

National Level

Sudan added substantially to its power generation capacity in the period 2010–2018 (52% increase), although most of the growth occurred before 2015. The country's capacity is equally divided between thermal and hydroelectric sources. However, nearly a third of that capacity is non-operational. Corresponding to this low growth in operational capacity is a slow increase in total power generation since 2015; less than 5% a year to 15,488 GWh in 2018. Imports totaled less than 5% of supply in 2018.

The household survey data indicates that the proportion of households supplied with electricity grew modestly in the nation as a whole after 2010. In 2018, urban households were approaching universal coverage at 84%, while only about half of rural dwellers had access. With more households and businesses served by the national grid and the leveling off of supply, the number of power outages must have increased.

There is little available information about the national transmission network, except to note that the high-voltage portion of the system dominates at 9,470 km.

There is no information about the regulatory environment, but SEHC (see below) appears to be a monopoly integrated provider.

Utility level

The power distributor, Sudanese Electricity Holding Company (SEHC), has significant opportunities to grow and to upgrade its grid. While its current customer base of 2.6 million is two-thirds greater than its 2010 number, customers are likely underserved.

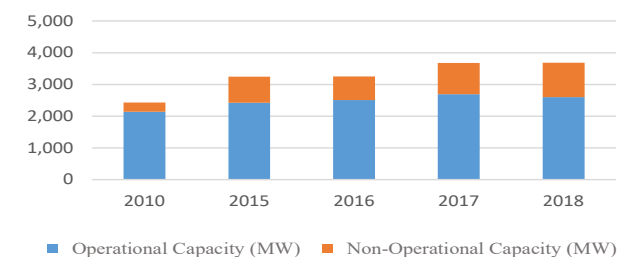
Total revenue (in Sudanese Pounds) rose from 1.1 billion in 2010 to 6.7 billion in 2010, with an escalating price contributing a little more than the growth in delivered electricity.

ENERGY NATIONAL FACT SHEET SUDAN

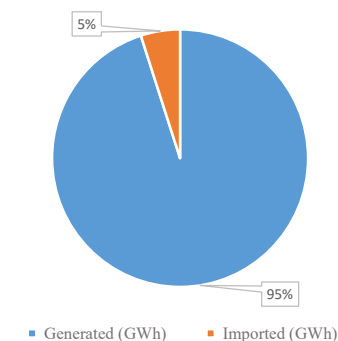
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	2,430.1	3,246.0	3,252.0	3,677.0	3,682.0
2. Generation capacity hydro-electric (MW)	1,592.0	1,592.0	1,592.0	1,912.0	1,912.0
3. Generation capacity conventional thermal (MW)	838.1	1,654.0	1,660.0	1,765.0	1,765.0
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	0.0	0.0	0.0	5.0
6. Operational Capacity (MW)	2,145.2	2,425.2	2,511.8	2,691.6	2,603.3
7. Non-Operational Capacity (MW)	284.9	820.8	740.2	985.5	1,078.7
8. Generation capacity of isolated (off grid) systems (MW)	132.0	100.0	100.0	100.0	100.0
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	82.0	77.6	77.6	77.6	80.7
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	7,499.0	13,056.2	14,412.1	14,924.4	15,488.7
2. Imported (GWh)	...	440.0	468.8	891.1	808.0
3. Exported (GWh)	...	5.0	6.0	...	...
III. Transmission					
1. HV transmission: length (Km)	...	...	...	9,470.0	...
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	...	...	...	1,180.0	...
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	...	...	...	320.0	...
IV. Access to electricity					
1. National (% of population)	40.6	49.4	53.0	56.5	59.8
2. Urban (% of urban population)	69.5	78.5	80.4	82.2	83.8
3. Rural (% of rural population)	26.3	34.4	38.9	43.0	47.1
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	...	...	...	...	...
2. Sector Specific: De facto Unbundling Generation-Transmission	...	...	...	...	...
3. Sector Specific: De Jure Unbundling Distribution-Transmission	...	...	...	...	...
4. Sector Specific: De Facto Unbundling Distribution-Transmission	...	...	...	...	...
5. Sector Specific: De Jure Unbundling Generation-Distribution	...	...	...	...	...
6. Sector Specific: De facto Unbundling Generation-Distribution	...	...	...	...	...
7. Reform: Number of Operators Generation	...	...	...	...	...
8. Reform: Number of Operators Transmission	...	...	...	...	...
9. Reform: Number of Operators Distribution	...	...	...	...	...
10. Sector Specific: Minimum quality standards	...	...	...	...	...
11. Sector Specific: Penalties for non Compliance	...	...	...	...	...
12. Sector Specific: Cut off possibility	...	...	...	...	...
13. Sector Specific: Renewable energy	...	...	...	...	...
14. Reform: Market Model	...	...	...	...	...

Charts

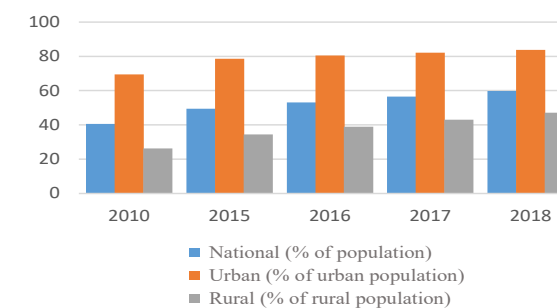
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



Electricity access



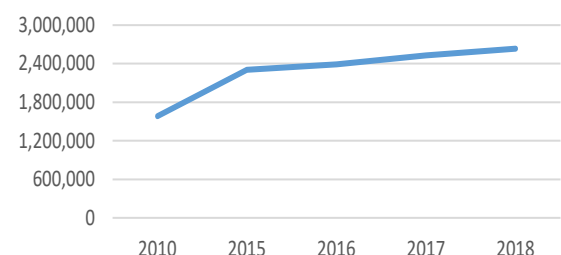
Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

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ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: SUDAN
UTILITY NAME: SEHC- Sudanese Electricity Holding Company

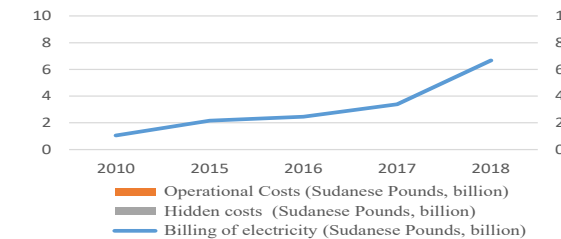
INDICATORS	2010	2015	2016	2017	2018	Charts
I. Access (number of customers, '000)						
1. Total actual customers of which:	1,584.3	2,303.1	2,392.1	2,528.7	2,635.6	
- Low voltage customers	...	...	...	...	...
- Medium voltage customers	...	...	...	...	...
- High voltage customers	...	...	...	...	...
2. Potential additional customers	...	...	...	...	...
II. Financial						
1. Billing of electricity (Sudanese Pounds, billion)	1.1	2.2	2.5	3.4	6.7	
2. Operational Costs (Sudanese Pounds, billion)	...	...	...	...	...
3. Hidden costs (Sudanese Pounds, billion)	...	...	...	...	...
4. Average effective tariff (Sudanese Pounds/Kwh)	0.2	0.2	0.2	0.3	0.5	
III. Technical						
1. Electricity sold, volume (GWh)	6,026.0	10,580.6	11,795.5	12,986.6	14,004.1	
2. Electricity generated, volume (GWh)	7,615.0	13,573.0	14,898.3	16,431.7	16,766.0	
3. System losses (% electricity generated) Of which:	...	...	...	...	...
- Distribution losses (%)	...	...	...	...	...
- Transmission losses (%)	5.0	5.0	5.0	5.0	5.0	
4. Employees (number)	7,279.0	...	...	...	...
5. Labor productivity (MWh/employee)	1,046.2	...	...	...	...

Customers



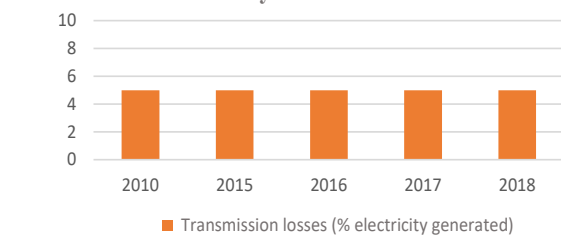
Year	Customers ('000)
2010	1,584.3
2015	2,303.1
2016	2,392.1
2017	2,528.7
2018	2,635.6

Operational vs. Hidden Costs



Year	Operational Costs (Sudanese Pounds, billion)	Hidden costs (Sudanese Pounds, billion)	Billing of electricity (Sudanese Pounds, billion)
2010	1.1
2015	2.2
2016	2.5
2017	3.4
2018	6.7

System losses



Year	Transmission losses (% electricity generated)
2010	5.0
2015	5.0
2016	5.0
2017	5.0
2018	5.0

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Tanzania

National Level

Tanzania has experienced significant growth in its national energy capacity in recent years. This is shown in its 2018 generation capacity (1,594 MW), which was 50% higher than its 2010 capacity. Similarly, total electricity generated domestically increased at nearly the same rate (43%) over the same period, from 5,098 to 7,277 GWh. At the same time, a tiny portion of demand (123 GWh) was met by imports, as of 2018, representing less than 2% of total supply.

Nearly all of the growth in supply has been conventional thermal, with almost no development of new hydropower or other renewable supplies.

The growth in supply is not reflected in the household survey data, which indicates that the proportion of urban households supplied with electricity approximately doubled in 2010–2018 but rural households experienced far lower access during the same period, from 2.5% in 2010 to 19% in 2018. However, while supply has continuously grown over the entire period, coverage growth has stalled since 2015. It appears that much of the growth in supply recently has been absorbed by unmet demand or growth in demand at the household or enterprise level.

The high-voltage transmission network seems to have expanded at rates that reflect the growth in national demand. However, low-voltage capacity represented over 80% of the transmission in 2018. While no historical data has been supplied on this part of the grid, it is likely that most of this is relatively new, reaching into rural and peri-urban areas that were not supplied at all in the past. Nonetheless, experience suggests that a systematic physical inventory of the transmission system would yield a substantial investment opportunity.

For investors, the regulatory environment is variable, while opportunities are evident:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural and some urban areas; this is an interesting area for renewable providers.
- For suppliers to the grid, the opportunities to launch an independent power provider are mixed. The incumbent has been growing its share of the total generation supply and there is no room in regulation for IPPs. The ten reported suppliers in Tanzania have not increased in number, either.
- On the side of local distribution, there seems also to be no regulatory space for competition, suggesting the two independent firms operating today are geographically defined. There may be other barriers to entry that are not specific to the industry not reported here.

Utility Level

The dominant power provider, Tanzania Electric Supply Company Ltd (TANESCO) has opportunities to grow and to upgrade its grid. The number of actual customers (2.5 million) by 2018, had grown at a remarkable rate – 280% since 2010. One third of the urban population and two-thirds of the rural population remain to be served, according to the household access survey, so there is room for further growth. However, while growth in the number of customers connected has risen quickly, revenue growth has barely moved since 2015, presumably as the network has expanded to lower-demand areas.



System losses from transmission and distribution total 16%. This is significantly better than many providers in Africa, but with space to reduce further to 5–7%. TANESCO has eliminated about a third of the losses from its distribution network since 2010. These losses show up as “hidden costs”, or lost revenue opportunities, totaling over 18% of revenue in 2018. This will limit the firm’s opportunity for profitability. While investment in the transmission and distribution network will yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be further reduced by moving to a prepaid system.

TANESCO has doubled its labor productivity, in terms of volumes sold, since 2010.

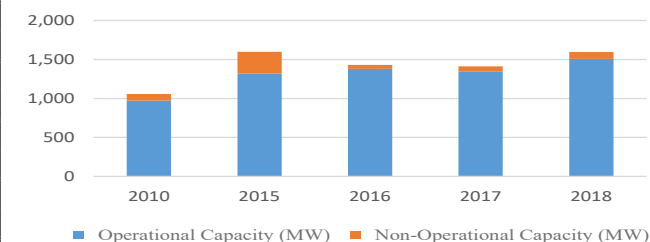


ENERGY NATIONAL FACT SHEET TANZANIA

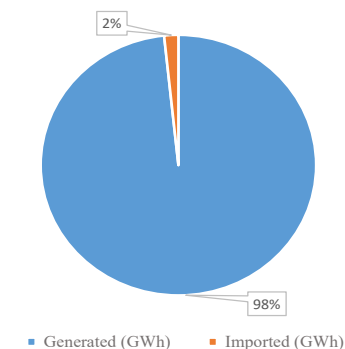
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	1,058.4	1,597.5	1,430.3	1,411.6	1,594.3
2. Generation capacity hydro-electric (MW)	561.8	561.8	567.1	567.7	573.7
3. Generation capacity conventional thermal (MW)	496.5	1,035.6	852.7	833.4	1,010.1
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	...	...	10.5	10.5	10.5
6. Operational Capacity (MW)	971.6	1,320.7	1,378.5	1,346.7	1,508.2
7. Non-Operational Capacity (MW)	86.7	276.7	51.8	64.9	86.1
8. Generation capacity of isolated (off grid) systems (MW)	55.4	81.2	64.3	64.1	40.3
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	25.8	60.8	54.6	60.7	57.2
10. Generation capacity of emergency generation (MW)	...	...	...	...	...
II. Generation					
1. Total Generated (GWh)	5,098.0	6,394.0	6,959.7	7,114.1	7,276.9
2. Imported (GWh)	57.5	71.3	101.5	105.6	123.0
3. Exported (GWh)	0.0	0.0	0.0	0.0	0.0
III. Transmission					
1. HV transmission: length (Km)	4,408.7	4,852.7	5,522.7	5,773.3	5,896.3
2. HV transmission in need of rehabilitation: length (Km)	....	....	....	....	....
3. MV transmission: length (Km)	....	....	....	....	9,976.0
4. MV transmission in need of rehabilitation: length (Km)	....	....	....	....	....
5. LV transmission: length (Km)	....	....	....	....	68,819.6
IV. Access to electricity					
1. National (% of population)	14.8	26.5	32.8	32.7	35.6
2. Urban (% of urban population)	46.2	58.5	65.3	65.2	68.3
3. Rural (% of rural population)	2.5	11.8	17.3	16.7	18.8
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	10	10	10	10	10
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	3	3	3	3	3
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"

Charts

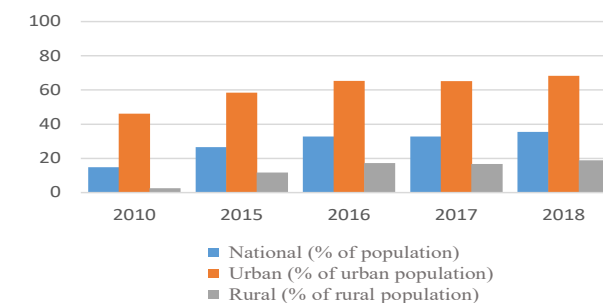
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



Electricity access



Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

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ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: TANZANIA
UTILITY NAME: TANESCO- Tanzania Electric Supply Company (Limited)

INDICATORS	2010	2015	2016	2017	2018	Charts																																																						
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1. Total actual customers of which:	652.7	1,594.8	1,900.4	2,223.6	2,484.2																																																							
- Low voltage customers	652.4	1,594.2	1,899.7	2,222.9	2,483.4																																																							
- Medium voltage customers	0.3	0.6	0.6	0.7	0.8																																																							
- High voltage customers	0.0	0.0	0.0	0.0	0.0																																																							
2. Potential additional customers	847.6																																																							
II. Financial																																																												
1. Billing of electricity (Tanzanian Shilling, billion)	545.7	1,379.7	1,415.3	1,436.2	1,535.3																																																							
2. Operational Costs (Tanzanian Shilling, billion)	510.5	299.7	274.1	168.8	201.0																																																							
3. Hidden costs (Tanzanian Shilling, billion)	91.8	233.1	216.4	199.5	280.9																																																							
4. Average effective tariff (Tanzanian Shilling/Kwh)	136.4	248.6	233.6	250.7	234.4																																																							
III. Technical																																																												
1. Electricity sold, volume (GWh)	4,000.0	5,549.0	6,059.0	5,729.0	6,551.0																																																							
2. Electricity generated, volume (GWh)	3,034.7	5,151.1	5,417.7	5,725.4	7,483.2																																																							
3. System losses (% electricity generated) Of which:	22.2	18.2	17.1	13.9	16.0																																																							
- Distribution losses (%)	15.7	12.1	10.9	7.9	10.1																																																							
- Transmission losses (%)	6.5	6.1	6.2	6.0	5.9																																																							
4. Employees (number)	5,664.0	6,328.0	6,469.0	6,784.0	6,975.0																																																							
5. Labor productivity (MWh/employee)	535.8	814.0	837.5	844.0	1,072.9																																																							

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Uganda

National Level

Uganda significantly increased its national energy capacity by 45% between 2010 and 2018; from 679 MW to 984 MW. However, total electricity generated domestically from 2010–2018 increased at a much higher rate (64%) from 2,406 to 3,944 GWh. There is a small portion of generation (6%) that is exported, but the generation growth can still only be explained by previously excess capacity being put to use.

Reflecting a global trend, but far ahead of the trend in Africa, renewable sources of energy are increasing, while traditional thermal power generation is declining in Uganda. Hydroelectric generation capacity has grown by 82%, while sources such as wind, solar, etc. have nearly quadrupled. These two sources now represent 76% and 14%, respectively, of the nation's total generation capacity.

The growth in supply is reflected in an unusual fact of the household survey data. Access to electricity has grown much faster in rural than in urban areas; to the extent that in 2018 rural households' access to the grid was only 20% less than that of urban households. This unmet urban demand (42.5% are not connected) is a significant growth opportunity for distributors.

The national transmission network has expanded at rates that reflect the growth in national generation capacity. High-voltage transmission, which was non-existent in 2010, has been built quickly to rival its medium-voltage counterpart. The two together increased by 77% from 2010 to 2018. While no part of the transmission system is reported to be in need of rehabilitation, this is more likely to be true for the newer, high-voltage portion than the rest. Experience suggests that a systematic physical inventory of the transmission system might yield a substantially larger investment opportunity than is immediately apparent.

For investors, the regulatory environment is open:

- For providers of renewable electricity supplies, there are incentives to promote such installations. Investors may find IPP, isolated grid and/or household supplies opportunities.
- Generally, for suppliers to the grid, the opportunities to launch an independent power provider have been proven, with 37 such suppliers operating as of 2018.
- On the side of local distribution, there is a permissive regulatory environment for competition. Six firms were operating in 2018, but these appear to be geographically bounded.

Utility Level

UEDC

The power distribution in eight service territories outside the urban and peri-urban concession was granted to UMEME (see below). The Uganda Electricity Distribution Company (UEDC) has limited opportunities to grow. UEDC's customer base in 2018 (1.35 million) was 250% higher than its 2010 level (386,000). The company's revenue growth has tracked its increase in customer numbers, even as the utility has moved into rural areas, presumably with lower marginal revenue.

Like many utilities on the continent, UEDC operates with significant inefficiencies. System losses

from transmission and distribution total 19%, although that number has reduced by 43% since 2010. However, an efficient producer would run with losses of about 5–7%. These show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability. These hidden costs amounted to 26% of revenue in 2018. UEDC ascribes most of these losses to the distribution network, which is usual. While investment in the distribution and older parts of the transmission network will likely yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

UEDC’s labor productivity over the period 2010–2018, in terms of volumes sold, increased by only 6%.

UMEME

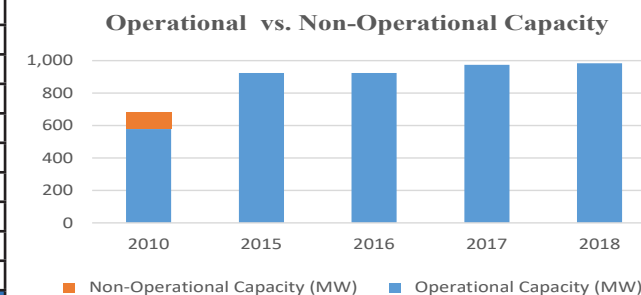
As the concession holder in most of Uganda since 2005, UMEME is the largest distributor of electricity in the country. From 2010 to 2018, its customers tripled to 1.3 million, while revenue more than tripled during the same period to reach 1.6 trillion shillings.

UMEME almost halved its system losses during the period under review. At 16.6%, the losses are at the lower range for the region, but still above the 5-7% desirable level. The opportunity (or “hidden”) cost of these losses is close to a fifth of its 2018 revenue. While investment in the distribution system is likely to yield significant returns in terms of reducing technical losses, non-technical losses and a reduction in accounts receivable could be reduced by continuing to expand the prepaid system. Labor productivity in the period 2010–2018, in terms of volumes sold, improved by 17% and was ranked highly for the region in 2018, at 2,384 MWh per employee.

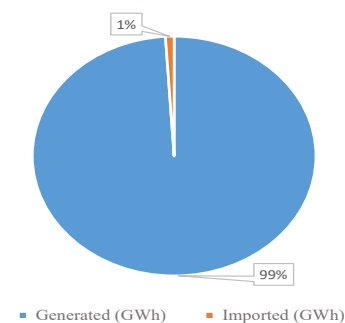
ENERGY NATIONAL FACT SHEET UGANDA

INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	679.0	924.9	924.9	974.8	984.0
2. Generation capacity hydro-electric (MW)	408.5	675.8	675.8	717.9	744.3
3. Generation capacity conventional thermal (MW)	235.0	135.0	139.0	139.0	101.6
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	36.0	91.0	107.9	117.9	138.1
6. Operational Capacity (MW)	579.0	924.9	924.9	974.8	984.0
7. Non-Operational Capacity (MW)	100.0	0.0	0.0	0.0	0.0
8. Generation capacity of isolated (off grid) systems (MW)	0.0	5.1	5.1	5.1	7.4
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	0.0	5.1	5.1	5.1	7.4
10. Generation capacity of emergency generation (MW)	235.0	135.0	139.0	139.0	101.6
II. Generation					
1. Total Generated (GWh)	2,406.0	3,282.9	3,365.2	3,855.5	3,944.3
2. Imported (GWh)	32.2	48.5	40.7	13.4	39.0
3. Exported (GWh)	76.5	121.5	165.0	316.6	233.1
III. Transmission					
1. HV transmission: length (Km)	0.0	150.0	150.0	150.0	1,008.0
2. HV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
3. MV transmission: length (Km)	1,326.0	1,442.0	1,442.0	1,442.0	1,527.0
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	...	...
5. LV transmission: length (Km)	35.0	35.0	35.0	35.0	35.0
IV. Access to electricity					
1. National (% of population)	12.1	18.5	26.7	31.8	42.7
2. Urban (% of urban population)	48.0	51.9	57.5	56.4	57.5
3. Rural (% of rural population)	3.5	9.0	17.7	24.4	38.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	no	no	no	no	no
2. Sector Specific: De facto Unbundling Generation-Transmission	no	no	no	no	no
3. Sector Specific: De Jure Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
4. Sector Specific: De Facto Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	11	18	19	23	37
8. Reform: Number of Operators Transmission	1	1	1	1	1
9. Reform: Number of Operators Distribution	5	9	9	10	6
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"	"Wholesale Competition"

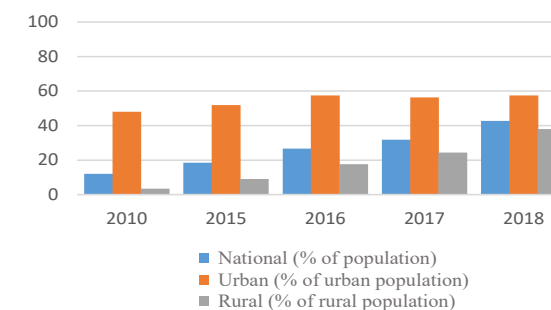
Charts



Generated vs. Imported Electricity: 2018



Electricity access



Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

ENERGY UTILITY PERFORMANCE FACT SHEET

COUNTRY NAME: UGANDA

UTILITY NAME: UEDC- Uganda Electricity Distribution Company (Limited)

INDICATORS	2010	2015	2016	2017	2018	Charts																								
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1. Total actual customers of which:	385.8	863.4	985.9	1,177.9	1,352.7																									
- Low voltage customers	384.1	860.0	982.8	1,174.6	1,349.4																									
- Medium voltage customers	1.7	3.4	3.1	3.2	3.3																									
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III. Technical																														
1. Electricity sold, volume (GWh)	1,627.0	2,502.1	2,617.6	2,815.4	3,050.1																									
2. Electricity generated, volume (GWh)	2,456.0	3,324.0	3,531.0	3,867.0	4,234.6																									
3. System losses (% electricity generated) Of which:	32.6	21.4	21.7	19.2	18.6																									
- Distribution losses (%)	28.4	18.3	17.7	15.3	15.0																									
- Transmission losses (%)	4.3	3.2	3.9	3.9	3.6																									
4. Employees (number)	1,182.0	1,634.0	1,704.0	1,815.0	1,907.0																									
5. Labor productivity (MWh/employee)	2,077.8	2,034.3	2,072.2	2,130.6	2,220.6																									

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: UGANDA
UTILITY NAME: UMEME LIMITED

INDICATORS	2010	2015	2016	2017	2018	Charts																																																						
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4. Employees (number)	1,142.0	1,363.0	1,384.0	1,472.0	1,514.0																																																							
5. Labor productivity (MWh/employee)	2,035.0	2,238.4	2,291.9	2,264.9	2,384.4																																																							

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



Country Report – Zambia

National Level

Zambia raised its national energy capacity between 2010 and 2018 by 62% to 2,898 MW. However, total electricity generated domestically increased over the same period at a fraction of that rate (18%), from 11,304 to 13,316 GWh. Domestic supply only grew by 12%, as the difference was exported. In 2015, 2016 and 2017, there were sizable imports of power, suggesting that significant portions of the capacity were not available, despite the country reporting only tiny amounts of non-available capacity.

The growth in supply is reflected in the household survey data, which indicates that the proportion of households supplied with electricity increased slowly over the period 2010–2018, especially in the rural areas. Nationally, by 2018 availability grew to 40%, with the rural coverage at 11% and urban coverage much higher at 77%. Since load-shedding information has not been supplied, it is not clear why the nominal capacity of the system grew so much faster than the actual supply and this warrants further investigation.

The national transmission network seems to have expanded at rates that reflect the overall growth of generation capacity, although no baseline information was reported. While only 10% of the transmission system is reported to be in need of rehabilitation, it seems likely that a systematic physical inventory of the transmission system would yield a substantially larger investment opportunity than is immediately apparent.

For investors, the regulatory environment is mixed:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have opened up for off-grid (households) and isolated grid providers in the rural areas; this presents an interesting area for renewable providers.
- For suppliers to the grid, the opportunities to launch an independent power provider have been proven, with seven suppliers and three buyers operating as of 2018.
- On the side of local distribution, there seems to be an unfriendly regulatory environment for competition.

Utility Level

The largest power provider, Zambia Electricity Supply Corporation (ZESCO) has significant opportunities to grow and to upgrade its grid. The number of customers (958,000) in 2018 seems to be far below the numbers in the service area, based on the household survey. Revenue growth at over 500% since 2010 has outpaced customer growth. Since the total volume supplied has increased much more slowly than revenue, the average effective tariff more than tripled in the period 2010–2018.

Like many utilities on the continent, ZESCO operates with significant inefficiencies, although these are lower than many other operators in the region. System losses from transmission and distribution total 16% (2018), whereas an efficient producer would run with losses of about 5–7%. These show up as “hidden costs” or lost revenue opportunities, so burdening the firm’s opportunity for profitability; in 2018 these “hidden costs” represented 12% of revenue. ZESCO attributes these losses



equally to the transmission and distribution network, which is possible, given the age of the network. While investment in the transmission and distribution network will yield significant returns in terms of technical losses, non-technical losses from theft and other unbilled supplies in the distribution network could be reduced by moving to a prepaid system.

Labor productivity (MWh per employee) fell by almost 40% in the period 2010–2018.

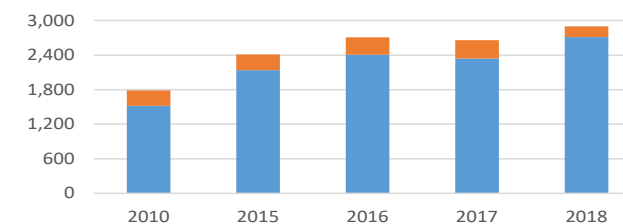


ENERGY NATIONAL FACT SHEET ZAMBIA

INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	1,786.0	2,411.0	2,709.1	2,659.3	2,898.2
2. Generation capacity hydro-electric (MW)	1,698.8	2,271.0	2,270.5	2,160.7	2,398.3
3. Generation capacity conventional thermal (MW)	87.3	140.0	438.6	498.6	498.6
4. Generation capacity nuclear (MW)	0.0	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	0.0	0.0	0.0	0.0	0.0
6. Operational Capacity (MW)	1,518.3	2,139.9	2,408.1	2,340.7	2,710.8
7. Non-Operational Capacity (MW)	267.7	271.1	300.9	318.6	187.5
8. Generation capacity of isolated (off grid) systems (MW)	0.0	0.0	0.0	0.0	0.0
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)	0.0	0.0	0.0	0.0	0.0
10. Generation capacity of emergency generation (MW)	80.0	80.0	80.0	80.0	80.0
II. Generation					
1. Total Generated (GWh)	11,304.0	13,442.0	11,721.5	13,170.8	13,316.2
2. Imported (GWh)	12.9	797.9	2,103.6	752.9	152.2
3. Exported (GWh)	550.9	1,172.2	767.8	1,082.2	1,250.4
III. Transmission					
1. HV transmission: length (Km)	...	13,980.0	15,920.0	16,767.4	...
2. HV transmission in need of rehabilitation: length (Km)	...	2,074.0	2,074.0	2,422.4	...
3. MV transmission: length (Km)	...	7,380.5	8,170.0	8,818.6	...
4. MV transmission in need of rehabilitation: length (Km)	...	...	...	1,271.0	...
5. LV transmission: length (Km)	...	12,911.0	13,189.1	14,165.4	...
IV. Access to electricity					
1. National (% of population)	22.0	31.1	35.3	40.3	39.8
2. Urban (% of urban population)	49.8	67.7	70.6	75.2	77.2
3. Rural (% of rural population)	4.0	4.7	9.3	14.0	11.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission	yes	yes	yes	yes	yes
2. Sector Specific: De facto Unbundling Generation-Transmission	yes	yes	yes	yes	yes
3. Sector Specific: De Jure Unbundling Distribution-Transmission	no	no	no	no	no
4. Sector Specific: De Facto Unbundling Distribution-Transmission	yes	yes	yes	yes	yes
5. Sector Specific: De Jure Unbundling Generation-Distribution	no	no	no	no	no
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes	yes	yes
7. Reform: Number of Operators Generation	4	6	7	7	7
8. Reform: Number of Operators Transmission	2	2	2	2	2
9. Reform: Number of Operators Distribution	3	3	3	3	3
10. Sector Specific: Minimum quality standards	yes	yes	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes	yes	yes
14. Reform: Market Model	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"	"Single Buyer Model"

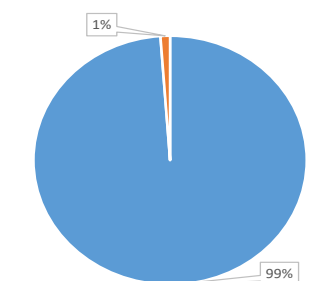
Charts

Operational vs. Non-Operational Capacity



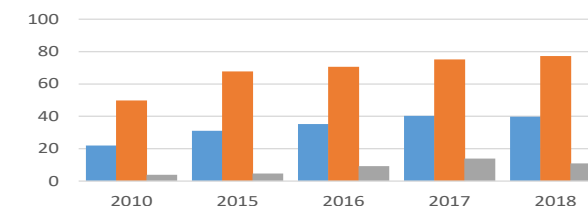
■ Operational Capacity (MW) ■ Non-Operational Capacity (MW)

Generated vs. Imported Electricity: 2018



■ Generated (GWh) ■ Imported (GWh)

Electricity access



■ National (% of population)
■ Urban (% of urban population)
■ Rural (% of rural population)

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



ENERGY UTILITY PERFORMANCE FACT SHEET
COUNTRY NAME: ZAMBIA
UTILITY NAME: ZESCO- Zambia Electricity Supply Corporation (Limited)

INDICATORS	2010	2015	2016	2017	2018	<div>Charts</div> <div><div>Customers</div><div>Operational vs. Hidden Costs</div><div>System losses</div></div>
I. Access (number of customers, '000)						
1. Total actual customers of which:	410.5	740.3	831.5	901.0	957.8	
- Low voltage customers	365.3	677.6	758.1	815.0	...	
- Medium voltage customers	38.9	53.9	64.3	77.3	...	
- High voltage customers	6.3	8.7	9.0	8.8	...	
2. Potential additional customers	0.0	0.1	0.0	0.0	...	
II. Financial						
1. Billing of electricity (Zambian Kwacha, billion)	1.7	6.4	8.2	7.4	9.5	
2. Operational Costs (Zambian Kwacha, billion)	1.0	4.3	4.4	3.2	5.8	
3. Hidden costs (Zambian Kwacha, billion)	0.3	1.0	1.1	0.9	1.1	
4. Average effective tariff (Zambian Kwacha/kwh)	0.2	0.6	0.7	0.5	0.7	
III. Technical						
1. Electricity sold, volume (GWh)	9,013.0	11,247.0	12,436.0	13,882.0	14,169.0	
2. Electricity generated, volume (GWh)	11,101.0	11,640.0	10,909.0	12,221.0	10,847.0	
3. System losses (% electricity generated) Of which:	11.9	14.5	15.0	13.9	15.6	
- Distribution losses (%)	6.7	6.1	6.2	6.8	10.5	
- Transmission losses (%)	5.2	8.3	8.9	7.0	5.1	
4. Employees (number)	4,335.0	6,817.0	6,791.0	6,772.0	6,988.0	
5. Labor productivity (MWh/employee)	2,560.8	1,707.5	1,606.4	1,804.6	1,552.2	

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available

Country Report – Zimbabwe

National Level

Zimbabwe's national energy capacity increased by 24% between 2015 and 2018, to reach 2,080 MW in 2018. However, the total electricity generated significantly declined by nearly 19% over the same period to 7,735 GWh. At the same time, imports shot up to 17% of total supply to cover the generation shortfall (net of exports) at 1,112 GWh. Much of the stagnation in domestic generation may be due to non-operational capacity, which averaged 25% for the period 2015–2018; this is an unusually high share for the region. Electrical generation capacity is split equally between thermal and hydropower.

The limited growth in supply is reflected in the household survey data, which indicates that the proportion of households supplied with electricity barely moved from 2010–2018. Nationally, availability stood at 41% in 2018, with the rural coverage creeping up from 17% in 2010 to 20% in 2018. Since load-shedding information has not been supplied, it is not clear to what degree the supply is adequate to meet demand, although normal growth in demand would make increasing gaps likely.

The national transmission network has expanded modestly. Medium-voltage transmission has kept pace with the growth in new power sources, at 24% from 2015 to 2018. Meanwhile, the low-voltage transmission system grew by 16% during the same period, reflecting the expansion of service to more rural areas. While the high-voltage transmission system is reported to be barely in need of rehabilitation, this may be an artefact of reporting, since 20% of the newer medium-voltage portion is reported in need of such work. Experience suggests that it is likely that a systematic physical inventory of the transmission system would reveal a substantially large investment opportunity.

For investors, the regulatory environment is difficult:

- For providers of renewable electricity supplies, there are incentives to promote such installations. The market may have specifically opened a gap for off-grid and isolated grid providers in the rural areas, as well as household supplies.
- For suppliers to the grid, the opportunities to launch an independent power provider have not been proven since all generators are owned by government.
- In terms of local distribution, there seems to be no permissive regulatory environment for competition.

Utility Level

The monopoly incumbent power provider, Zimbabwe Electricity Transmission and Distribution Company (ZETDC) has significant opportunities to grow and to upgrade its grid. The actual customers (754,000) as at 2018, represent only 40% of the households that could be served, according to the national household survey data. Customer and revenue numbers remained flat from 2015 to 2018.

Like many utilities on the continent, ZETDC operates with significant inefficiencies. System losses from transmission and distribution total 32%, whereas an efficient producer would run with losses of about 5–7%. These show up as “hidden costs” or lost revenue opportunities, so burdening the firm's opportunity for profitability. For the year 2018, these hidden costs were equivalent to 39% of the company's electricity sales. ZETDC attributes nearly all of these losses to the distribution network.



While investment in the transmission and distribution network will yield significant returns in terms of technical losses, non-technical losses and receivables could be reduced by moving more customers to the prepaid system.

Following a steep decline in 2016, labor productivity in 2018 in terms of volumes sold almost returned to 2015 levels, albeit low for the region at 1,019 MWh per employee.

ENERGY NATIONAL FACT SHEET ZIMBABWE

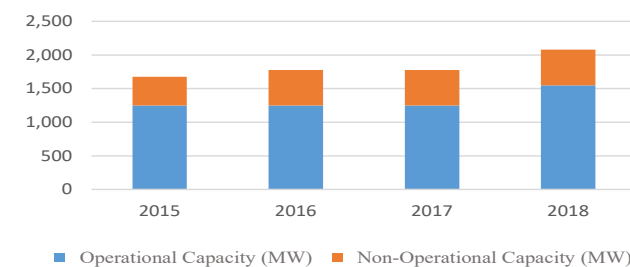
INDICATORS	2010	2015	2016	2017	2018
I. Capacity					
1. Installed Generation Capacity (MW)	...	1,675.0	1,778.0	1,778.0	2,080.0
2. Generation capacity hydro-electric (MW)	...	770.0	770.0	770.0	1,070.0
3. Generation capacity conventional thermal (MW)	...	900.0	1,000.0	1,000.0	1,000.0
4. Generation capacity nuclear (MW)	...	0.0	0.0	0.0	0.0
5. Generation capacity solar, wind, biomass, geothermal	...	5.0	8.0	8.0	10.0
6. Operational Capacity (MW)	...	1,250.0	1,250.0	1,250.0	1,550.0
7. Non-Operational Capacity (MW)	...	425.0	528.0	528.0	530.0
8. Generation capacity of isolated (off grid) systems (MW)
9. Generation capacity of isolated (off-grid) systems in operating condition (MW)
10. Generation capacity of emergency generation (MW)	100.0	100.0	100.0
II. Generation					
1. Total Generated (GWh)	8,090.0	9,585.1	6,975.9	7,278.2	7,734.9
2. Imported (GWh)	...	623.0	2,296.0	2,570.0	1,629.0
3. Exported (GWh)	...	960.0	371.0	351.0	517.0
III. Transmission					
1. HV transmission: length (Km)	...	5,439.0	5,439.0	5,439.0	5,439.0
2. HV transmission in need of rehabilitation: length (Km)	...	100.0	180.0	155.0	120.0
3. MV transmission: length (Km)	...	7,968.0	8,504.0	8,756.0	9,946.0
4. MV transmission in need of rehabilitation: length (Km)	...	1,003.0	2,897.0	2,376.0	1,896.0
5. LV transmission: length (Km)	...	45,671.0	47,235.0	49,524.0	52,976.0
IV. Access to electricity					
1. National (% of population)	39.8	33.7	39.9	40.5	41.0
2. Urban (% of urban population)	85.2	81.2	85.3	85.3	85.3
3. Rural (% of rural population)	17.2	10.9	18.3	19.2	20.0
V. Regulatory					
1. Sector Specific: De Jure Unbundling Generation-Transmission
2. Sector Specific: De facto Unbundling Generation-Transmission	yes	yes	yes
3. Sector Specific: De Jure Unbundling Distribution-Transmission
4. Sector Specific: De Facto Unbundling Distribution-Transmission	no	no	no
5. Sector Specific: De Jure Unbundling Generation-Distribution	yes	yes	yes
6. Sector Specific: De facto Unbundling Generation-Distribution	yes	yes	yes
7. Reform: Number of Operators Generation	5	5	5
8. Reform: Number of Operators Transmission	1	1	1
9. Reform: Number of Operators Distribution	1	1	1
10. Sector Specific: Minimum quality standards	yes	yes	yes
11. Sector Specific: Penalties for non Compliance	yes	yes	yes
12. Sector Specific: Cut off possibility	yes	yes	yes
13. Sector Specific: Renewable energy	yes	yes	yes
14. Reform: Market Model	"Integrated Monopoly"	"Integrated Monopoly"	"Integrated Monopoly"

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

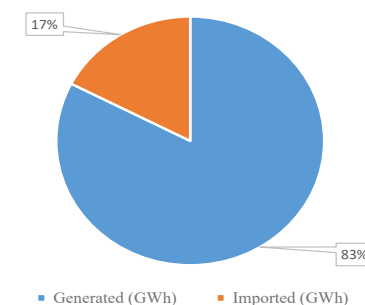
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Charts

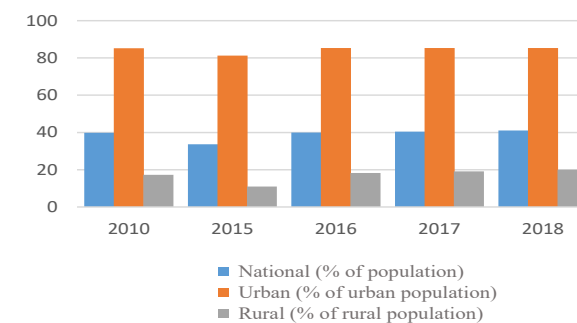
Operational vs. Non-Operational Capacity



Generated vs. Imported Electricity: 2018



Electricity access





ENERGY UTILITY PERFORMANCE FACT SHEET

COUNTRY NAME: ZIMBABWE

UTILITY NAME: ZETDC- Zimbabwe Electricity Transmission and Distribution Company

INDICATORS	2010	2015	2016	2017	2018	Charts
I. Access (number of customers, '000)						
1. Total actual customers of which:	...	681.3	700.3	726.3	754.4	
- Low voltage customers	...	626.0	640.0	656.5	674.7	
- Medium voltage customers	...	47.4	51.9	60.0	69.5	
- High voltage customers	...	7.9	8.4	9.8	10.2	
2. Potential additional customers	...	13.0	14.2	15.4	18.2	
II. Financial						
1. Billing of electricity (US\$, million)	...	743.9	773.0	698.7	742.1	
2. Operational Costs (US\$, million)	...	945.1	947.8	...	...
3. Hidden costs (US\$, million)	...	220.5	229.2	318.0	292.9	
4. Average effective tariff (US\$/Kwh)	...	10.0	10.6	10.0	10.0	
III. Technical						
1. Electricity sold, volume (GWh)	...	7,474.0	7,318.0	6,987.0	7,421.0	
2. Electricity generated, volume (GWh)	...	9,269.0	7,056.0	7,398.0	9,174.0	
3. System losses (% electricity generated) Of which:	...	23.9	30.8	43.0	31.9	
- Distribution losses (%)	...	13.7	19.1	27.9	20.3	
- Transmission losses (%)	...	3.5	3.4	6.2	3.8	
4. Employees (number)	...	9,000.0	9,000.0	9,000.0	9,000.0	
5. Labor productivity (MWh/employee)	...	1,029.9	784.0	822.0	1,019.3	

Customers

Year	Customers ('000)
2015	681.3
2016	700.3
2017	726.3
2018	754.4

Operational vs. Hidden Costs

Year	Operational Costs (US\$, million)	Hidden costs (US\$, million)	Billing of electricity (US\$, million)
2015	945.1	220.5	743.9
2016	947.8	229.2	773.0
2017	...	318.0	698.7
2018	...	292.9	742.1

System losses

Year	Distribution losses (%)	Transmission losses (%)	Total system losses (%)
2015	13.7	3.5	23.9
2016	19.1	3.4	30.8
2017	27.9	6.2	43.0
2018	20.3	3.8	31.9

Source: African Development Bank based on Africa Infrastructure Knowledge Program (AIKP) Database.

... : non available



Annexes

List of indicators

	Series Code	Indicator Name	Definition
Utility Performance indicators	a192	Customers	Residential customers in utility service area (connected to power)
	a203	LV Customers	LV customers in utility service area (connected to power)
	a205	MV Customers	MV customers in utility service area (connected to power)
	a207	HV Customers	HV customers in utility service area (connected to power)
	a214	Potential Customers	Total potential customers in utility service area (not connected to power, but with technical possibility to be connected)
	b069	Billing of electricity	Total Electricity Billed, annual
	b076	Operational Costs	Total Operational Costs per year (excluding depreciation and debt service)
	b206	Revenue, total	Total Utility Revenue (annual):
	b059	Connection charge, residential customers	Connection charge, residential customers
	b237	Tariff, average effective	Tariff, average effective
	b052	System Losses	System Losses
	b055	Transmission losses	Transmission losses
	b056	Distribution losses	Distribution losses
	b057	Employees	Total number of employees
	b234	Electricity sold, volume	Electricity sold, volume
	b235	Electricity generated, volume	Electricity generated, volume
	b001	Installed Generation Capacity	Total capacity of the interconnected grid in hydro-electric, conventional thermal, nuclear, and solar, wind, biomass, geothermal. This variable includes IPP generation capacity but excludes emergency generation and self-generation capacities.
	b002	Generation capacity hydro-electric	Capacity of hydro-electric plants on the interconnected grid
	b003	Generation capacity conventional thermal	Capacity of electric plants using oil, gas and coal on the interconnected grid
	b004	Generation capacity nuclear	Capacity of nuclear plants
	b005	Generation capacity solar, wind, biomass, geothermal	Capacity of generators using: sun, wind, wood, waste, combustible renewables and other biomass and geothermal sources.

Technical indicators - National Level	b006	Generation Capacity Operational	Available capacity of the power plant, i.e. the maximum capacity at which the stations can be operated (annual report)
	b007	Generation capacity of isolated (off grid) systems	The rated capacity as stated on the nameplate of the equipment in the isolated power plant. These are not part of the interconnected network.
	b008	Generation capacity of isolated (off-grid) systems in operating condition	Available capacity of the isolated power plants, i.e. the maximum capacity at which the stations can be operated and it is instantly available for us
	b009	Generation capacity of emergency generation	Total capacity of emergency generators available per year
		Total generation	Consists of net electricity generated on the interconnected grid
	b022	Imports	Total Annual Net Import
	b023	Exports	Total Annual Net Exports
	b024	HV transmission: length	Total cumulative length of the high voltage transmission network
	b025	HV transmission in need of rehabilitation: length	Total cumulative length of the high voltage transmission network in need of rehabilitation
	b026	MV transmission: length	Total cumulative length of the medium voltage transmission network
	b027	MV transmission in need of rehabilitation: length	Total cumulative length of the medium voltage transmission network in need of rehabilitation
	b028	LV transmission: length	Total cumulative length of the low voltage transmission network
Access indicators		Population access to electricity-National (% of population)	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.
		Population access to electricity-Urban (% of population)	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.
		Population access to electricity-Rural (% of population)	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.

Institutional Indicators	d001	Sector Specific: De Jure Unbundling Generation-Transmission	By Law, companies providing generation and transmission of electricity cannot be owned by the same operator
	d002	Sector Specific: De facto Unbundling Generation-Transmission	Generation of electricity and Transmission of Electricity are provided by different companies
	d003	Sector Specific: De Jure Unbundling Distribution-Transmission	By Law, companies providing distribution and transmission of electricity cannot be owned by the same operator
	d004	Sector Specific: De Facto Unbundling Distribution-Transmission	Distribution of electricity and Transmission of Electricity are provided by different companies
	d005	Sector Specific: De Jure Unbundling Generation-Distribution	By Law, companies providing generation and distribution of electricity cannot be owned by the same operator
	d006	Sector Specific: De facto Unbundling Generation-Distribution	Generation of electricity and Distribution of Electricity are provided by different companies
	d012	Reform: Market Model	Description of the market structure based on the level of competition within each segment of the industry and the level of competition allowed
	d017	Reform: Number of Operators Generation	Number of active operators currently providing the service
	d021	Reform: Number of Operators Transmission	Number of active operators currently providing the service
	d025	Reform: Number of Operators Distribution	Number of active operators currently providing the service
	d037	Sector Specific: Minimum quality standards	Whether regulation defines minimum quality standards for operations
	d038	Sector Specific: Penalties for non Compliance	Whether regulation establishes penalties for non compliance to minimum quality standards
	d039	Sector Specific: Cut off possibility	Whether utility can cut-off service in case of non-payment
	d044	Sector Specific: Renewable energy	Whether there are incentives for renewable energy

ENERGY UTILITY PERFORMANCE FACT SHEET METADATA

INDICATORS	Definitions, Technical Notes & Motivations	Data Sources	Formula
I. Access (customers) 1. Total actual customers of which: - Low voltage customers - Medium voltage customers - High voltage customers 2. Potential customers	This refers to the total number of customers reported by the utility as being formally connected to power service. <i>Customers type.</i> It is useful to distinguish between actual customers who are already connected, and <i>potential customers</i> who are those resident in the utility service area but may not yet be connected to the service.	AIKP data	Actual customers. Raw data collected directly from power utilities.
	<i>Voltage type.</i> It is also relevant to distinguish between customers according to the type of electricity they use: high voltage (typically large industrial customers), <i>medium voltage</i> (typically smaller industrial or commercial customers), and <i>low voltage</i> (typically small commercial and domestic customers).	AIKP data	Potential customers. Raw data collected directly from power utilities.
II. Financial 1. Billing of electricity (LCU) 2. Operational Costs (LCU) 3. Hidden costs (LCU) 4. Average effective tariff (LCU/Kwh)	<i>Billing of electricity:</i> It is the total electricity billed annually. A bill for money owed to the power utility for electricity used. The electricity used is defined as the total usage in kilowatts per hour (KWh). The charge is the amount the customer pays for each KWh used.	AIKP data	Billing of electricity. Raw data collected directly from power utilities.
	<i>Operational Cost:</i> Also known as operating cost refers to expenses associated with the maintenance and administration of the power utility's business per year (excluding depreciation and debt service). This includes, but is not limited to, staff cost, amortisation, legal expenses, consultancy expenses, audit fees, transport and travel expenses, insurance, bank charge and commission, advertisement expenses, etc.	AIKP data	Operational Costs. Raw data collected directly from power utilities.
	<i>Hidden costs:</i> This defines and evaluates key external costs and benefits that are associated with the production, distribution, and use of energy, but are not reflected in market prices.	AIKP data	Hidden costs are calculated as the product of the system losses (in KWh) and the average effective tariff.
	Power utilities typically apply highly complex tariff schedules that allow tariffs to vary across different categories of customers, different volumes of consumption, different loads on the system, different locations, and even different times of day. For that reason, there is no single easily measurable "price" of power. Nevertheless, utilities are typically able to report their average effective tariff, and this is the reference variable that will be used for price.		Data are collected in local currency. USD/local currency annual average exchange rate can be used to convert local currency data into USD.
	The average effective tariff is the average amount that the utility charges for a kilowatt-hour of electricity, looking across all different customer groups and tariff charges.	AIKP data	The average effective tariff is the total amount billed, divided by the total volume of power sold.

IV. Technical 1. Electricity sold, volume (GWh) 2. Electricity generated (GWh) 3. System losses (% electricity generated) Of which: - Transmission losses(%) - Distribution losses(%) 4. Employees (number) 5. Labor productivity (MWh/employee)	Electricity sold: This is the amount of electricity that is sold to customers connected to the public system in GWh per year .	AIKP data	Raw data collected directly from power utilities.
	Electricity generated: This is the volume of electricity produced by the utility expressed in GWh per year.	AIKP data	Raw data collected directly from power utilities.
	System losses: They capture the percentage of power produced that is lost during the transmission and the distribution on its way to the final consumer. Some of this power is lost due to deficiencies in the transmission or distribution infrastructure, while some of it is simply stolen from the network by consumers. Technical losses are energy lost due to resistance and iron core losses which occur during the process of transmission and distribution. Non-Technical losses are energy lost due to unmetered and unbilled consumption including illegal connections and incorrect estimation of legal consumption due to meter tampering and inadequate billing. Non-Technical losses are also called commercial losses.	AIKP data	System losses are calculated as the difference between the electricity going into the interconnected system (which is electricity generated, net of trade) minus electricity sold. Losses are expressed as percentage of electricity produced.
	Employees: It means the workers engaged in the work of a power utility.	AIKP data	Raw data collected directly from power utilities.
	Labor productivity: It measures the relationship between the quantity of electricity generated and the number of staff in the utility.	AIKP data	Labor productivity is calculated as the ratio of electricity generated (in MWh) to total number of utility personnel.

Source: African Development Bank based on AIKP Database.

ENERGY NATIONAL FACT SHEET METADATA

INDICATORS	Definitions, Technical Notes & Motivations	Data Sources
I. Capacity <ol style="list-style-type: none"> 1. Installed Generation Capacity (MW) 2. Generation capacity hydro-electric (MW) 3. Generation capacity conventional thermal (MW) 4. Generation capacity nuclear (MW) 5. Generation capacity solar, wind, biomass, geothermal 6. Operational Capacity (MW) 7. Non-Operational Capacity (MW) 8. Generation capacity of isolated (off grid) systems (MW) 9. Generation capacity of isolated (off-grid) systems in operating condition (MW) 10. Generation capacity of emergency generation (MW) 	<p>Installed Generation Capacity: Total capacity of the interconnected grid in hydro-electric, conventional thermal, nuclear, and solar, wind, biomass, geothermal. This variable includes IPP generation capacity but excludes emergency generation and self-generation capacities.</p> <p>Generation capacity hydro-electric: Capacity of hydro-electric plants on the interconnected grid.</p> <p>Generation capacity conventional thermal: Capacity of electric plants using oil, gas and coal on the interconnected grid.</p> <p>Generation capacity nuclear: Capacity of nuclear plants.</p> <p>Generation capacity solar, wind, biomass, geothermal: Capacity of generators using sun, wind, wood, waste, combustible renewables and other biomass and geothermal sources.</p> <p>Operational Capacity: Available capacity of the power plant, i.e. the maximum capacity at which the stations can be operated (annual report).</p> <p>Non-Operational Capacity: Non available capacity of the power plant, i.e. the maximum capacity at which the stations can not be operated (annual report).</p> <p>Generation capacity of isolated (off grid) systems: The rated capacity as stated on the nameplate of the equipment in the isolated power plant. These are not part of the interconnected network.</p> <p>Generation capacity of isolated (off-grid) systems in operating condition: Available capacity of the isolated power plants, i.e. the maximum capacity at which the stations can be operated and it is instantly available for us.</p> <p>Generation capacity of emergency generation: Total capacity of emergency generators available per year.</p>	<p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p>
II. Generation <ol style="list-style-type: none"> 1. Total Generated (GWh) 2. Imported (GWh) 3. Exported (GWh) 	<p>Total electricity generated: In this Power Statistics Pocketbook, it refers to gross production, which is the sum of the electrical energy production by all the generating units/installations concerned (including pumped storage) measured at the output terminals of the main generators.</p> <p>Imported electricity: Total Annual Net Imports.</p> <p>Exported electricity: Total Annual Net Exports.</p>	<p>AFREC</p> <p>AIKP data</p> <p>AIKP data</p>
III. Transmission <ol style="list-style-type: none"> 1. HV transmission: length (Km) 2. HV transmission in need of rehabilitation: length (Km) 3. MV transmission: length (Km) 4. MV transmission in need of rehabilitation: length (Km) 5. LV transmission: length (Km) 	<p>HV transmission: Total cumulative length of the high voltage transmission network.</p> <p>HV transmission in need of rehabilitation: Total cumulative length of the high voltage transmission network in need of rehabilitation.</p> <p>MV transmission: Total cumulative length of the medium voltage transmission network in need of rehabilitation.</p> <p>LV transmission: Total cumulative length of the low voltage transmission network.</p>	<p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p> <p>AIKP data</p>

IV. Access to electricity 1. National (% of population) 2. Urban (% of urban population) 3. Rural (% of rural population)	<i>Access to electricity, national:</i> It is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.	WDI
	<i>Access to electricity, urban:</i> It is to the percentage of urban population with access to electricity.	WDI
	<i>Access to electricity, rural:</i> It is the percentage of rural population with access to electricity.	WDI
V. Regulatory 1. Sector Specific: De Jure Unbundling Generation-Transmission (1=yes, 0=no) 2. Sector Specific: De facto Unbundling Generation-Transmission (1=yes, 0=no) 3. Sector Specific: De Jure Unbundling Distribution-Transmission (1=yes, 0=no) 4. Sector Specific: De Facto Unbundling Distribution-Transmission (1=yes, 0=no) 5. Sector Specific: De Jure Unbundling Generation-Distribution (1=yes, 0=no) 6. Sector Specific: De facto Unbundling Generation-Distribution (1=yes, 0=no) 7. Reform: Number of Operators Generation (number) 8. Reform: Number of Operators Transmission (number) 9. Reform: Number of Operators Distribution (number) 10. Sector Specific: Minimum quality standards (1=yes, 0=no) 11. Sector Specific: Penalties for non Compliance (1=yes, 0=no) 12. Sector Specific: Cut off possibility (1=yes, 0=no) 13. Sector Specific: Renewable energy (1=yes, 0=no) 14. Reform: Market Model (0=same company, 1=single buyer model, 2=Wholesale competition, 3=Retail competition)	<i>De Jure Unbundling Generation-Transmission:</i> By Law, companies providing generation and transmission of electricity cannot be owned by the same operator.	AIKP data
	<i>De facto Unbundling Generation-Transmission:</i> Generation of electricity and Transmission of Electricity are provided by different companies.	AIKP data
	<i>De Jure Unbundling Distribution-Transmission:</i> By Law, companies providing distribution and transmission of electricity cannot be owned by the same operator.	AIKP data
	<i>De Facto Unbundling Distribution-Transmission:</i> Distribution of electricity and Transmission of Electricity are provided by different companies.	AIKP data
	<i>De Jure Unbundling Generation-Distribution:</i> By Law, companies providing generation and distribution of electricity cannot be owned by the same operator.	AIKP data
	<i>De facto Unbundling Generation-Distribution:</i> Generation of electricity and Distribution of Electricity are provided by different companies.	AIKP data
	<i>Number of Operators Generation:</i> Number of active operators currently providing the service.	AIKP data
	<i>Number of Operators Transmission:</i> Number of active operators currently providing the service.	AIKP data
	<i>Number of Operators Distribution:</i> Number of active operators currently providing the service.	AIKP data
	<i>Minimum quality standards:</i> Whether regulation defines minimum quality standards for operations.	AIKP data
	<i>Penalties for non Compliance:</i> Whether regulation establishes penalties for non compliance to minimum quality standards.	AIKP data
	<i>Cut off possibility:</i> Whether utility can cut-off service in case of non-payment.	AIKP data
	<i>Renewable energy:</i> Whether there are incentives for renewable energy.	AIKP data
	<i>Market Model:</i> Description of the market structure based on the level of competition within each segment of the industry and the level of competition allowed.	AIKP data

Source: African Development Bank based on AIKP Database and various national and international data sources.