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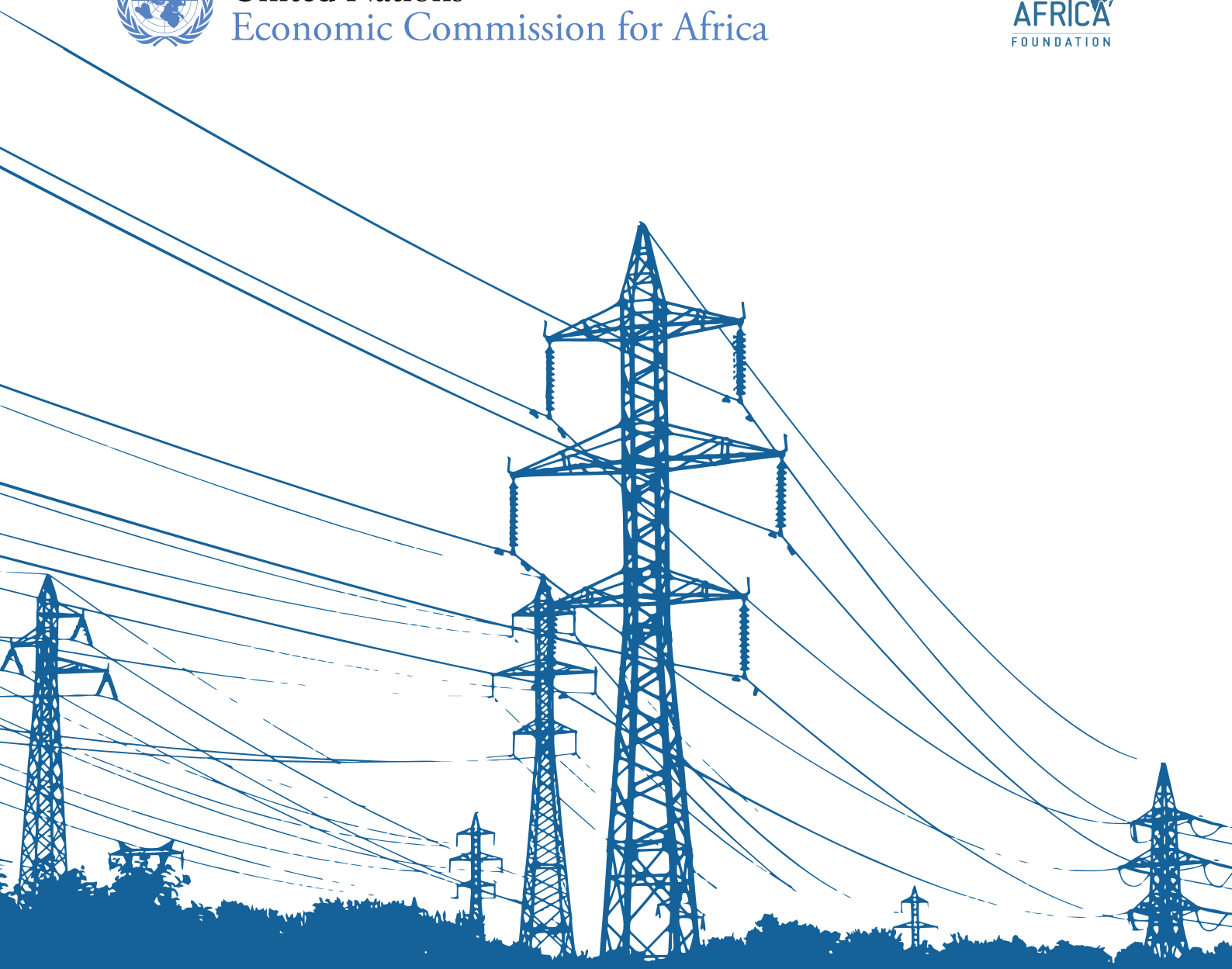

Regulatory Review of the Electricity Market in Zambia:

Towards Crowding-in Private Sector Investment

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Cover Illustration by Maxim Larin

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Executive Summary

This report provides an analysis of the Zambian electricity sector policies, laws, and regulations in relation to crowding-in private sector participation in developing national electricity infrastructure. The report is part of the United Nations Economic Commission for Africa and RES4Africa Foundation joint program on *Regulatory Review of the Electricity Sector in Africa: Towards Crowding-in Private Sector Investment*.

Since 1991, which marked the beginning of a liberalization phase for Zambia's economy, and the adoption of a new National Energy Policy in 1994, private sector participation in the development of electricity infrastructure was encouraged, and the power sector was moving towards restructuring and liberalization. After the second wave of reforms in 2010, the way was paved for independent power producers to enter the market. Reforms such as the Renewable Energy Feed-in-Tariff Strategy in 2017 kick-started the development of the national renewable energy sector. Coupled with the adoption of the Rural Electrification Master Plan in 2008, Zambia was able to expand access to electricity from about 20 percent before 2010 to above 40 percent in 2019.

The review of the National Energy Policy in 2019 marked the beginning of the third wave of sector reforms. The new policy acknowledged the need to reform sector governance and the regulatory framework behind it. The diversification of the energy mix through the development of non-hydro renewables, the expansion of electrification efforts, including off-grid technologies, and the need to ensure the financial sustainability of the sector with tariff revisions were drivers behind electricity sector reforms.

Zambia has been able to successfully attract private participation in every segment of the electricity market. Nevertheless, the market retains its single-buyer model, dominated by the vertically integrated state-owned utility ZESCO. It owns about 75 percent of generation capacity, as well as the majority of transmission and distribution assets. The generation assets owned by ZESCO are almost exclusively hydropower plants, as a result, droughts have had significant impacts on the reliability of electricity supply. In recent years Zambia has suffered from weather induced electricity deficit, notably between 2015/2016 and 2019/2020, being obliged to introduce severe load shedding measures. The remaining 25 percent of generation assets are owned by Independent Power Producers and spread across hydro, thermal, and renewable resources. A peculiarity of Zambia's electricity market model compared to other African markets is the involvement of two private players in transmission and distribution services, the Copper Belt Energy Company and the North Western Energy Company, both operating network assets in mining provinces.

Considering the challenges still facing Zambia's electricity sector, particularly the persistence of load shedding, attracting more private sector participation in all segments of the market could be beneficial. In line with this general objective, the purpose of this regulatory review is to pinpoint the main strengths and gaps of the policy and regulatory framework currently in force related to private sector participation in the entire electricity market. It further aims to offer concrete recommendations for regulatory improvements and reforms towards attaining a competitive, resilient, and sustainable electricity market.

The regulatory analysis is undertaken following a comprehensive UNECA and RES4Africa regulatory review methodology, which was developed with the participation of African and international regulatory experts. The approach enables three broader assessments: the degree of *openness* of the electricity market to the private sector based on evaluation of the power sector structure and governance; the *attractiveness* of the market based on an assessment of sector economics, fair competition, and overall economic regulation; and the *readiness* of the market based on an assessment of technical regulations.

Main findings related to the Generation segment

Zambia's electricity sector legislation ensures an adequate degree of *openness* to private investments, providing a clear licensing framework and multiple options for private entities to enter the market. It also ensures a more coordinated and effective public procurement of infrastructure projects. Zambia performs well in areas of regulation relatd to the *attractiveness* and *readiness* Dimensions, with extraordinary performance in *contract regulation* thanks to strong regulatory oversight, clear guidelines, and a high degree of standardization. As such, Zambia has been able to successfully crowd-in independent power producers. However, key areas of improvement remain in all three Dimensions. Related to electricity market *openness,* Zambia would benefit from legally binding targets to strengthen energy policy implementation and restructuring of ZESCO to gradually reform the single-buyer market model and allow for increased routes-to-market for generators. Related to market *attractiveness*, although incentives and supporting mechanisms are defined in the policy framework, Zambia lacks dedicated implementing legislation for renewable energy development. The *readiness* Dimension requires further regulatory improvement, particularly in instituting dispatching rules, priority dispatching for certain technologies, and dedicated curtailment management rules, as well as the ability to bilaterally negotiate grid access contracts with the network operator.

Main findings related to the Transmission segment

Zambia is one of the few countries in Africa where private entities in the transmission segment are allowed to own assets and obtain licenses, enabling them to operate as transmission service providers. However, a transmission investment plan and clear network development targets are absent. Despite licenses being made available to private entities, the transmission segment only offers moderate *attractiveness* to the private sector, as the regulation doesn't define the standard provisions that need to be included in these licenses. The network tariff and wheeling charges are well defined in the Grid Code; however, implementation remains a challenge. The access to several *credit enhancement* instruments to private investors in the transmission segment (such as concessional lending and multilateral guarantees), except for public guarantees, is also possible, although such instruments have been mainly reseved to ZESCO so far. The regulatory environment in Zambia demonstrates *readiness*, since the *grid code* and *authorization and permits* cover aspects that are crucial for private sector participation in the transmission segment of the market. However, the bilaterally

negotiated grid connection agreements leave room for uncertainty for private players, and dispatching rules, priority dispatch for renewables, and dedicated curtailment management rules are currently lacking. Furthermore, data on dispatching and quality of transmission service is not publicly shared, limiting transparency.

Main findings related to the Distribution segment

Similar to the transmission segment, private sector participation is allowed in the distribution segment of the electricity market. Distribution licenses are accessible to private entities, as demonstrated by the Copperbelt Energy Company and North Western Energy Company, which own distribution networks and operate as distribution service providers over exclusive regional areas. Although public tenders may be used to procure new distribution infrastructure, this model is not yet utilized in the market. Zambia performs moderately well in the *attractiveness* Dimension of the distribution segment. While standardized distribution licenses are available to private entities, no information about their main provisions is publicly accessible. The distribution grid code sets out the principles and objectives of the distribution tariff and gives the Energy Regulation Board the mandate to regulate the price setting and the tariff structure for all distribution-related services. However, there are still shortcomings in applying this framework and implementing the periodical tariff revision. Similar to the transmissions segment, most *credit enhancement* instruments are available, except for public guarantees. The distribution code extensively outlines the basic rules, procedures, requirements, and standards governing the operation, maintenance, and development of Zambia's distribution system. It also oulines an open-access regime for all network users, defining connection agreement requirements. Hoiwever, there is a regulatory gap related to a standard contractual framework for connection agreements between the network operator and users.

Main findings related to the Off-grid segment

Zambia's off-grid market segment displays a high degree of *openness* to private investments thanks to recent regulatory reforms. For instance, the regulation for mini-grids introduced a dedicated licensing regime for off-grid operators and detailed requirements based on capacity thresholds. All necessary information is made publicly available on a dedicated off-grid web portal, managed by the national regulator. Off-grid operators benefit from multiple models for market entry. The existence of a dedicated Rural Electrification Authority simplify and ensure clear planning framework for electrification expansion. The new tariff rules for mini-grids and the availability of a range of incentives also offers an attractive regulatory environment, despite the lack of government guarantees and limited concessional lending. The public electrification authority has also the mandate to provide subisidieds to private off-grid developers on a competitive basis. The off-grid regulatory framework demonstrates a high degree of *readiness*, thanks to the well-defined technical requirements and the consideration of several options for mini-grid operators in the case of grid encroachment. Overall, the lack of unbundling in the electricity sector and the limited credit enhancement

options are a few of the challenges of this market segment that is otherwise well supported by regulatory advancements. The off-grid market has grown in recent years, demonstrating that various models are able to be successfully implemented.

To enhance the *Openness* of the electricity market

- Consider setting clear, achievable and binding targets for generation expansion, electricity access, grid expansion, served customers, and GHG reductions to guide policy implementation and provide long-term visibility to investors.
- Institute effective monitoring of the implementation of policies and roadmaps to ensure enforceability, track progress and increase accountability.
- Improve system planning by implementing formal plan review procedures, and a periodic review timeline.
- Include off-grid solutions in the integrated planning to develop the electricity supply industry across the value chain and increase access to electricity.
- Issue and publish detailed investment plans that outline medium-term project pipelines.
- Secure the long-term stability of the Energy Regulation Board's financial resources to ensure its budgetary autonomy and independence.
- Evaluate the benefits of the creation of an independent transmission operator by separating system operations and transmission service functions of ZESCO from its electricity generation functions to increase market transparency and ensure equal access to the market.
- Assess the feasibility and potentiual benefits for final customers of unbundling the generation and distribution functions of ZESCO to facilitate market competition.
- Move forward with market restructuring towards the introduction of more competition within the market, and not only for the market, to carry with its benefits of costs and price reductions.
- Publish schedules detailing medium-term public procurement plans of electricity infrastructure projects.

To enhance the *Attractiveness* of the electricity market

- Ensure that transmission and distribution licenses enable operators to receive fair remuneration for the services provided.
- Ensure to private network operators their ability to benefit from cost-reflective tariffs defined on common tariff setting principles set by the national regulator.

- Define regulatory guidelines on use of system or wheeling agreements to provide clarity to network customers on conditions of equal access.
- Undertake an extended cost-of-service study to discover the real cost structure of Zambia´s electricity supply industry.
- Unbundle electricity tariffs by differentiating price points for generation, transmission, and distribution services.
- Ensure the correct and regular implementation of the multi-year price review mechanisms to ensure cost-reflectiveness of tariffs over time.
- Provide legislative backing to renewable policies through the adoption of a dedicated renewable energy law defining the dedicated supporting schemes.
- Explore the potential of indirect incentives mechanisms, such as results-based financing and carbon price mechanisms, to support the business cases of electricity infrastructure investors.
- Evaluate the benefits of introducing credit enhancement instruments dedicated to network infrastructure investors.

To enhance the *Readiness* of the electricity market

- Consider the creation of a one-stop-shop, or a single-window, for processing and issuing of all authorizations and/or permits required for electricity infrastructure projects to reduce administrative and transaction costs.
- Review the network operation sub-code, notably the definition of dispatching rules and procedures, in light of increased diversification of the electricity generation mix and the entry of multiple players in the system.
- Ensure the effective implementation of fair and open access to network infrastructure through the review of grid access in network regulation, notably by:
    - Defining transparent wheeling charges and connection cost repartition rules;
    - Adopting a standard framework for connection agreements to increase transparency and enhance market readiness to private sector participation.
- Define national standards and institute a certification system for off-grid products and components.
- Ensure the full disclosure and regular update of all fundamental electricity market data, utilities and market operators financial statements and key socio-economic statistics.

As Zambia takes further bold steps towards its energy sector regulatory reform, the UN Economic Commission for Africa and the RES4Africa Foundation remain committed to partner with Zambia in addressing any of the identified regulatory and policy gaps. They also commit to supporting regulatory capacity development, as well as any area of particular reform interest of Zambia towards greater *openness*, *attractiveness*, and *readiness* of the electricity market.

Introduction

Skyline photo of Lusaka city at night
Photo credit: Jason J Mulikita/Getty Images

1. Introduction

Recognition that energy plays a key role in facilitating socio-economic development, and that its insufficient provision impedes it, has brought energy to the forefront of national, regional, and global agenda. National sector development strategies in most of Africa reflect the need to expand energy access rapidly, facilitated through the implementation of Sustainable Development Goals (SDGs), particularly SDG7. African states have pursued the energy access agenda, devoted public finance for energy infrastructure and capacity expansion, and instituted measures to strengthen the energy sector.

Latest global SDG7 tracking reports warn that progress made so far is not on track to achieving universal access by 2030 and that nearly 90 percent of the population without access at the end of the decade will be residing in Africa, partly due to rapid population growth.

Sustainable Development Goal 7 aims to ensure access to affordable, reliable, sustainable and modern energy for all.

Despite appreciable progress as a result of these measures, structural challenges remain within the electricity markets of Africa. Over 500 million people on the continent today lack access to electricity. Latest global SDG7 tracking reports warn that progress made so far is not on track to achieving universal access by 2030 and that nearly 90 percent of the population without access at the end of the decade will be residing in Africa, partly due to rapid population growth (IEA et al., 2020).

Financing energy development remains a key challenge. The cost of achieving the SDGs at large in the continent is estimated at about USD 1.3 trillion per year. Africa would require USD 32 billion per year through 2030 on universal electricity access-related investments (AfDB, 2019), with additional investment requirements on energy infrastructure. According to the Infrastructure Consortium for Africa, 37 percent of infrastructure investments in the continent was undertaken by African governments in 2018, with the private sector accounting for 11 percent (ICA, 2018). Given the major infrastructure investment gap and the limited investment role of the private sector so far, addressing the crowding-in of private sector investment in the electricity market is crucial.

Towards the goal of crowding-in the private sector, feasibility (bankability) of projects, country risks, profitability (viability), and the legal/regulatory environment are often identified as key barriers. Indeed, the regulatory framework is crucial for attracting private investments. The Regulatory Indicators for Sustainable Energy (ESMAP, 2020) indicate that more than half of the global population lacking access to electricity remained in countries with weak regulatory frameworks by 2019. These regulatory challenges remain to be addressed.

Zambia's electricity market is structured under a single-buyer model dominated by the state-owned utility ZESCO. Today, 75 percent of the generation assets are owned by ZESCO (almost exclusively hydro), with the remaining 25 percent split among independent power producers (IPPs) spread across hydro, thermal, and renewable resources. Due to the high reliance on hydropower, droughts have had significant impacts on the reliability of electricity provision, resulting in several hours of load shedding. ZESCO is also responsible for operating the transmission network and serving final customers connected to its transmission and distribution networks. A peculiarity of Zambia's electricity market model is the involvement of two private players in transmission and distribution services, the Copperbelt Energy Company (CEC) and the North Western Energy Company (NWEC), both operating network assets in mining provinces.

This regulatory review examines these and additional issues in-depth concerning the crowding-in of private sector investment in the electricity market of Zambia, from generation

to networks and off-grid market segments. The goal is, through regulatory improvement and expected increase in private sector participation, to promote the achievement of SDG7 goals and developing a resilient, competitive, diverse, and vibrant electricity market that will sustainably attract private capital to supplement public investment. This is particularly crucial in a post-COVID-19 environment where public resources are even more constrained due to priorities in public health and social protection, as well as economic recovery.

Country Overview

Kariba Dam, 1959, hydroelectric dam in the Kariba Gorge of the Zambezi river basin between Zambia and Zimbabwe.
(Photo credit: DeAgostini/Getty Images)

2. Country overview

The Republic of Zambia is a landlocked country in Southern Africa, surrounded by eight states: the Democratic Republic of Congo to the north; Tanzania to the north-east; Malawi to the east; Mozambique, Zimbabwe, Botswana, and Namibia to the south; and Angola to the west. Zambia has a reputation for political stability, having avoided war and upheavals that marked much of Africa's post-colonial history (BBC 2018).

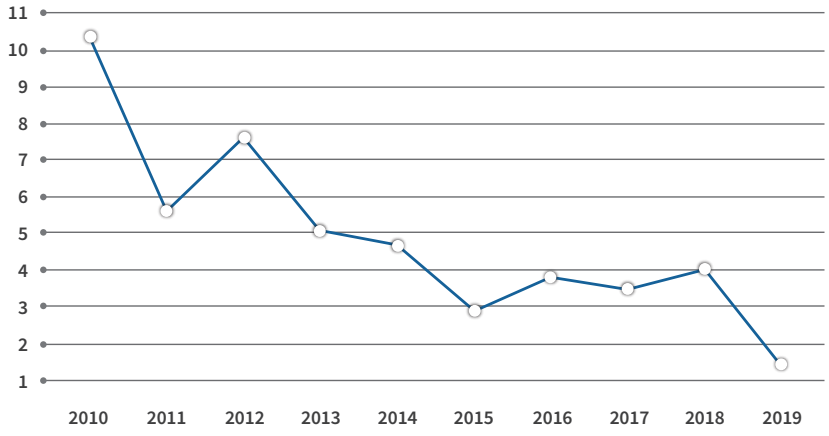
The country's population is estimated at 17.9 million, with about 44 percent living in urban areas (World Bank, n. d.). The population is growing faster than the sub-Saharan average, at a rate resulting in a doubling close to every 25 years (World Bank, 2021).

Map of Zambia credit: Peter Hermes Furian
Map of Africa credit: Geo Atlas Graphi Ogre

2.1 Macroeconomic overview

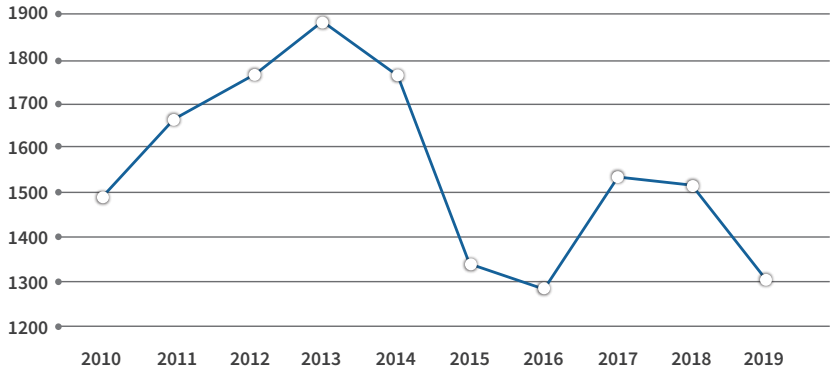
Following 15 years of rapid socio-economic progress and the achievement of middle-income status in 2011, Zambia's economic performance has stalled in recent years. Before 2014, Zambia had one of the world's fastest-growing economies, with real GDP growth averaging roughly 6.7 percent per year (Moody's, n. d.). However, growth slowed during the period 2015-2019 owing to declining copper prices, reduced power generation, and declining agricultural output. At the same time, the debt-to-GDP ratio rapidly increased, rising from 31.7 percent in 2014 to 76.5 percent in 2019, and reaching nearly 100 percent in 2020 (IMF, 2020). In November 2020, Zambia failed to make a USD 42.5 million payment on a Eurobond, putting the country in default. To address these macroeconomic challenges, the government launched an Economic Recovery Plan for 2020-2023 (GRZ, 2020).

Figure 1: GDP growth (%, 2010-2019)



Source: World Bank (n. d., accessed 2021)

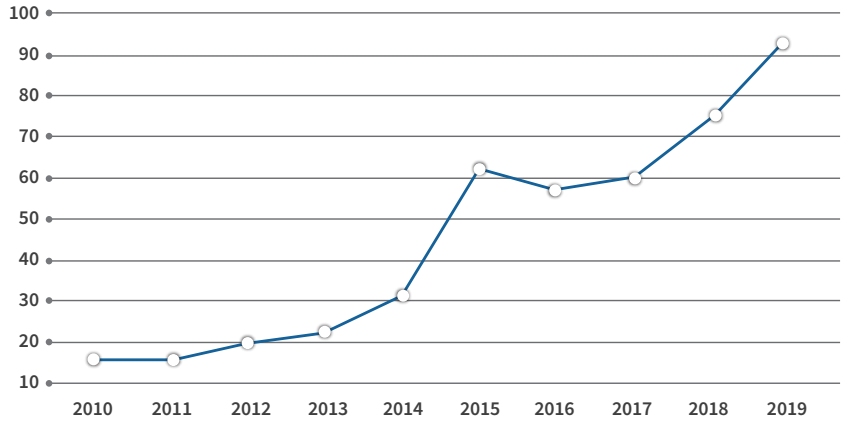
Figure 2: GDP per capita (USD, 2010-2019)



Source: World Bank (n. d., accessed 2021)

Debt-to-GDP

Figure 3: Debt to GDP ratio (2010-2019)



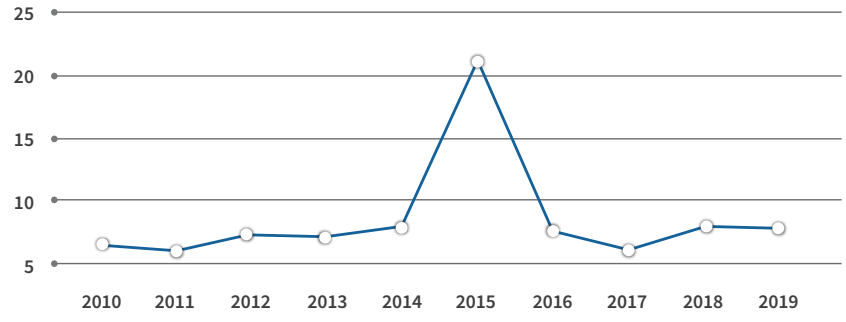
Source: IMF (2021)

Inflation and exchange rate stability

Zambia underwent a sharp rise in inflation largely during the era of nationalized industry, from 1985 (37.43 percent annual inflation rate) to 1993 (183.26 percent), after which inflation started to decline sharply (IMF, 2021). Between 2010 and 2019, inflation had fluctuated between about 6.58 percent and 17.87 percent. In January 2020, inflation rose further to 14.55 percent following the upward adjustment in electricity tariffs and fuel pump prices.

Additionally, the Zambian Kwacha has experienced a slow but steady depreciation in recent years (BOZ, 2021). Money supply and the price of copper, the country's major export commodity, accounted for most of the variation in exchange rates, with the latter generally having a larger impact (Roger et al., 2017).

Figure 4: Inflation rate (%, 2010-2019)



Source: Bank of Zambia (2021)

The World Bank's 2020 Ease of Doing Business index ranked Zambia 85th, scoring particularly well in the areas of getting credit (4th) and paying taxes (7th).

Business climate

The World Bank's 2020 Ease of Doing Business index ranked Zambia 85th, scoring particularly well in the areas of getting credit (4th) and paying taxes (7th) (World Bank, 2020). The main areas

of improvement included trading across borders, registering property, enforcing contracts, and getting electricity. The overall score is explained by lengthy procedures and high costs associated with these activities.

In principle, Zambia accords equal treatment to foreign investors, and state-owned enterprises do not enjoy preferential treatment by virtue of government ownership. They may, however, obtain protection when they are not able to compete or face adverse market conditions (U.S Department of State, 2019). Under the Zambia Development Agency Act (No. 11 of 2006), private actors are provided security for investments in the country through investment promotion and protection agreements.

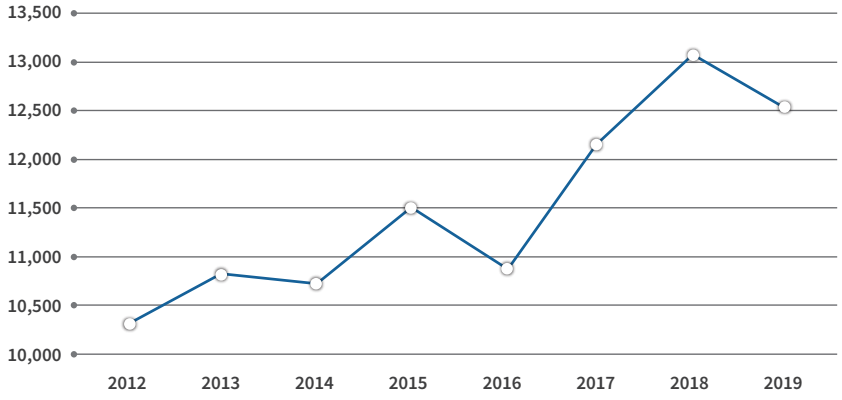
2.2 Electricity sector overview

Zambia's electricity sector is highly reliant on hydropower. As a result, due to erratic rains, declining water levels in Kariba Dam, and increased electricity demand, the country has been experiencing a severe electricity supply deficit since 2015 (GET.invest, n. d.). From 2016 onwards, additional non-hydro generation capacity became operational, diversifying Zambia's generation mix and incrementally reducing reliance on hydropower.

Electricity consumption

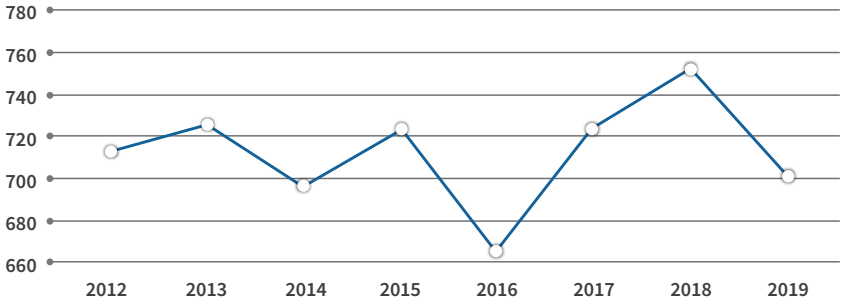
Zambia has seen growing power demand, with an average annual growth rate of more than 3 percent between 2010 and 2017 (Kabechani, 2019). Historically, it faced the challenge of staying ahead of peak demand, which rose from 1,575 MW in 2010 to 2,300 MW in 2017, largely driven by demand from the mining sector. The mining sector consumes an estimated 51 percent of total electricity consumed by end-users, followed by the domestic sector at 33 percent (ERB, 2019).

Figure 5: Electricity consumption, total (GWh, 2012-2019)



Source: ERB (2012-2019)

Figure 6: Electricity consumption, per capita (kWh, 2012-2019)



Source: ERB (2012-2019); World Bank (n. d., accessed 2021)

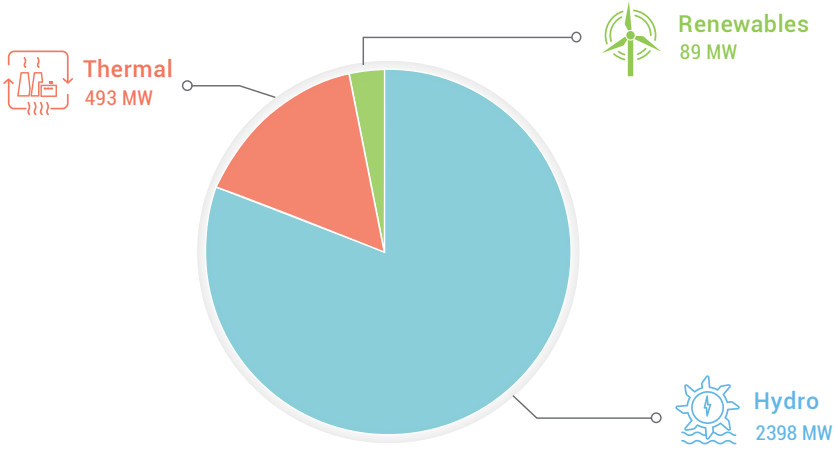
On-grid installed capacity and electricity production

Zambia's generation capacity grew from just under 2,000 MW in 2010 to nearly 3,000 MW by 2019. The vast majority of this capacity comes from hydro (80 percent), with thermal (17 percent) and renewable (3 percent) generation playing a growing role.

Zambia's generation capacity grew from just under 2,000 MW in 2010 to nearly 3,000 MW by 2019. The vast majority of this capacity comes from hydro (80 percent), with thermal (17 percent) and renewable (3 percent) generation playing a growing role (Republic of Zambia, 2019). Existing thermal generation capacity is split between the 300 MW Maamba coal plant, the 110 MW Ndola Energy heavy fuel oil plant, and the cumulative 80 MW emergency diesel plants owned and operated by the Copperbelt Energy Company. Renewable energy installed capacity is exclusively solar, representing about 90 MW in total.

After a decade of insignificant private sector growth in the electricity market, participation picked up in the 2010s, during which several new IPPs joined Zambia's generation fleet. Today, 75 percent of the generation assets are owned by the state-owned utility ZESCO, with the remaining 25 percent split among IPPs spread across hydro, thermal, and renewable resources.

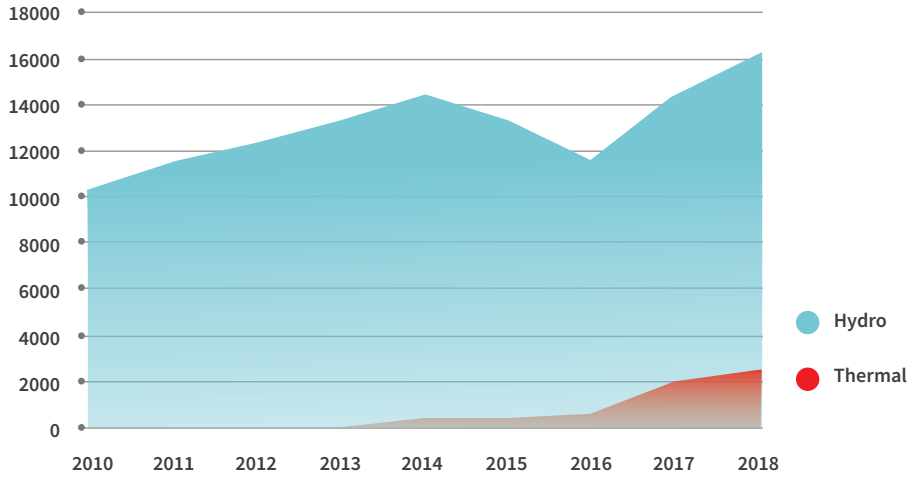
Figure 7: Installed generation capacity (MW, 2019)



Source: ERB (2019)

The Zambian power system has evolved from a hydro-based system to one with a generation mix containing both hydro and thermal components, the latter being added from 2016 onwards. Of the 15,040 GWh produced in 2019, a significant share of around 3,590 GWh was produced by IPPs (ERB, 2019).

Figure 8: Electricity production (GWh, 2010-2018)



Source: IEA (2020)

Access to electricity

ZESCO, the integrated state utility serving the majority of Zambia's electricity consumers, has seen its customer base grow steadily over the past two decades. Starting from just about 200,000 customers in 2000, the customer base reached over one million as of Augst 2019 (Zambiansun, 2019).

The Zambian Government has funded electrification projects from annual national budgets since the early 1980s (REMP, 2009). In 1994, it established the Rural Electrification Fund (REF) to increase the funding available for rural electrification projects and introduced a levy of 3 percent on all existing customers' electricity bills. Nevertheless, electrification remained low, with less than 3 percent of the rural population having access by the early 2000s (REF, 2021). As a result, the Rural Electrification Agency (REA) was established to independently administer the fund and provide electricity infrastructure to all rural areas using appropriate technologies (REA, 2003).

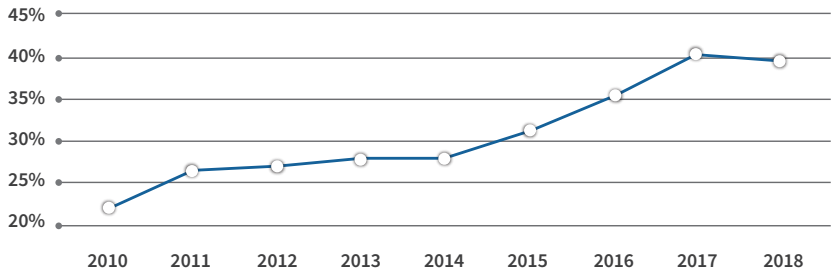
The REA developed a Rural Electrification Master Plan (REMP) for the period 2008-2030. the plan identified 1,217 rural growth centers throughout the country as targets for electrification via grid extension, mini-hydro power stations, or solar home systems. The aim of the Plan, in line with Zambia's Vision 2030, is to increase rural access to electricity from 3 percent (in 2009) to 51 percent by 2030 (REMP, 2009).

Since 2008, the improvement in urban areas has been significant, but rural electrification is progressing slowly. In 2014, five years after the REMP was published, the national access rate had reached 27.9 percent, with urban access at 61.5 percent, and rural access remaining low at 4.18 percent. In 2018, urban and rural access stood at 77.2 percent and 13.9 percent, respectively, corresponding to a national average of 39.8 percent (World Bank, 2018). Zambia's Health Demographic Survey-2018 (Government of Zambia, 2020) acknowledged a lower access at 32.8 percent on a national basis, with 70.6 percent in urban and only 8.1 percent in rural areas.

Since 2008, the improvement in urban areas has been significant, but rural electrification is progressing slowly. Zambia's Health Demographic Survey-2018 (Government of Zambia, 2020) acknowledged a lower access at 32.8 percent on a national basis, with 70.6 percent in urban and only 8.1 percent in rural areas.

To add to the existing rural electrification efforts, in 2017, the Government of Zambia, together with the World Bank, initiated a 5-year Electricity Service Access Project (ESAP). The ESAP is set to provide last-mile connections to the national grid to 22,000 low-income households and 1,000 small and medium-sized enterprises in rural areas (REA, 2017). In additionally, a new National Electrification Strategy (NES) is being drafted (to be finalized in 2021), to map out Zambia's path to electrification in line with Vision 2030 (Ministry of Energy, 2020).

Figure 9: Electrification rate (%, 2010-2018)



Source: World Bank (n. d., accessed 2021)

Electricity service quality and reliability

ZESCO has made progress in reducing its transmission and distribution losses over the last few years. In 2013, transmission losses stood at 7 percent, and distribution almost double at 13 percent (ERB, 2014). By 2018, the utility recorded transmission losses of 5.25 percent and distribution losses of 10.45 percent. In comparison, the privately managed Copperbelt Energy Company (CEC), incurred transmission losses of 3.0 percent in 2017, and only 2.27 percent in 2018 (ERB, 2018).

In 2014, the Energy Regulation Board (ERB) developed the Power Quality Management System to ensure power quality and reliability (in line with the standard ZS 387). To implement this system, the ERB has issued Power Quality Directives to all its licensees and has installed monitoring instruments at 66 percent of all relevant sites by the end of 2019. Between 2015 and 2019, overall compliance with the directive's targets increased from 64 percent to 77.1 percent, with the most notable improvement in unplanned interruptions due to a reduction in load shedding after the 2015-2016 power crisis (ERB, 2014).

However, Zambians still experience several hours of planned outages daily; up to 15 hours in April 2020 due to the consistent load-shedding implemented by ZESCO since 2015. As a result of the reduction of the production capacity of existing plants, Zambia was estimated to be facing a power deficit of 810 MW in 2020 (Lusakatimes, 2020).

The off-grid market has grown in recent years thanks to both government and private sector initiatives. As of 2018, there were several operational off-grid solutions in Zambia, including two public diesel mini-grids, at least four small hydro mini-grids, and five solar PV mini-grids, with further mini-grids under construction.

Off-grid electricity market

The off-grid market has grown in recent years thanks to both government and private sector initiatives. As of 2018, there were several operational off-grid solutions in Zambia, including two public diesel mini-grids, at least four small hydro mini-grids (one private, one public, two not-for-profits), and five solar PV mini-grids (four private, one public but run by a cooperative), with further mini-grids under construction (GET.invest, 2019). Most mini-grids are concentrated

in rural growth centers (RGCs), which are the most densely populated rural areas. This also responds to the recommendation set by the Rural Electrification Master Plan (REMP), which aims to further enhance RGCs electrification (Signify Foundation. 2019).

The main players in this off-grid market are ZESCO and the REA, which own the public mini-grids, and three independent power producers. However, some ownership models such as private, public and community have also been tested. The EU supported IAEREP Project is also developing the mini-grids in Lunga and Chunga using Public Private Partnership. In addition, some payment models which some are supported by FINTECH infrastructure have been tried and tested, hence guarateeing investors of innovatice, effective and efficient payment methods which reduce risks of customer default. Examples of payment models in use include: Cash And Carry, Pay As You Go and Energy As A Service.

Furthermore, in addition to mini-grids, other off-grid solutions are popular in Zambia, particularly solar lanterns, followed by rechargeable batteries and stand alone systems.

2.3 Electricity sector governance and market structure

Overview of electricity sector reforms

This section presents a summary of key events in the history of power reforms in Zambia, ranging from colonial to independence days, and until now.

The nationalization of Zambia's electricity sector (1969–1991)

Until 1969, the electricity sector consisted largely of private players. However, that year the parastatal Zambia Electricity Supply Corporation (ZESCO) was created to generate, transmit, and distribute power to the entire country, except for areas serviced by the then Central African Power Corporation, a predecessor of the Zambezi River Authority (ZRA). By 1972, all power assets had been nationalized and placed under the ownership of ZESCO. By 1980, Zambia entered a state of economic decline and generation capacity exceeded electricity consumption. Demand was still stagnant by 1982, with a maximum of 846 MW, compared to 1,608 MW installed capacity. The situation was further exacerbated by low power exports in 1988.

The first round of liberalization (1991-2008)

Starting from 1991, due to political changes in Zambia, the government initiated the liberalization of the national economy to attract more private participation in key sectors and meet the lending conditionalities of international financing institutions (Machungwa, 2005). The adoption of the National Energy Policy in 1994 marked a strategic change in the power sector, setting new priorities, such as the encouragement of private participation, the commercialization of ZESCO, the introduction of fair tariffs, the privatization of distribution, and integration in national and regional markets.

New legislation was enacted to achieve these goals. In 1995, the government repealed the Zambia Electricity Supply Act, eliminating ZESCO's statutory monopoly, and replaced it with a new Electricity Act, which allowed private participation in the electricity industry. The Energy Regulation Act, enacted in the same year, established the Energy Regulation Board (ERB) as

an independent regulator and the sole licensing authority of the sector. In 2003, the Rural Electrification Authority was established to support the electrification of rural areas.

During this period, the first private actors, the CEC and Lunsemfwa Hydro Power began operating in the country, both having entered the market by investing in existing assets. Overall, despite the liberalization of the sector, investments remained lackluster due to low tariffs which did not ensure sufficient returns.

Power sector crisis and attracting IPPs (2008-2020)

From 2000 to 2010, Zambia recorded robust economic growth and rapidly rising demand for electricity. However, investments in electricity assets did not maintain pace with growing demand, leading to a decline in power service quality and increasing load-shedding. This crisis pushed the government to undertake new actions and reforms to support the development of electricity infrastructure, including revisions of the National Energy Policy. Furthermore, electricity tariffs were increased to strengthen ZESCO's investment capacity, yet energy pricing remained a significant barrier to attracting more private participation (Ministry of Energy, 2019).

Since 2011, private investments are encouraged in generation assets through the IPP model by allowing producers to negotiate their own feed-in tariffs reflecting their costs of production. Several new IPPs entered Zambia's market during this period, including Ndola Energy (heavy fuel oil) in 2012, Itezhi Tezhi (hydro) and Maamba Collieries (coal) in 2016, Muhanya (solar) in 2017, and Bangweulu (solar) and Ngonye (solar) in 2018. In addition, the Renewable Energy Feed-in Tariff (REFiT) Strategy, approved in 2017, attracted more private investment, with the country's GET-Fit Program awarding 120 MW added solar PV capacity in 2019.

Institutions governing the electricity sector

The Zambian electricity sector is governed by main institutions: the Ministry of Energy; the Energy Regulation Board; the Rural Electrification Authority; the Office for Promoting Private Power Investment; and the Zambia Environmental Management Agency. These institutions oversee the range of market players operating in Zambia's power sector and work towards the implementation of electrification goals.

Table 1: Institutions governing the electricity sector

Ministry of Energy (MoE)	The Ministry of Energy (MoE) was established in 2016, along with the Ministry of Water Development, Sanitation, and Environmental Protection, from the former Ministry of Energy and Water Development (Zambia Government Gazette, 2016). The MoE is responsible for developing and managing the energy sector, as well as for overseeing other statutory bodies and state-owned enterprises in the sector.
Energy Regulation Board (ERB)	The Energy Regulation Board, created by the Energy Regulation Act of 1995, is the national regulatory authority for the energy sector and is directly responsible for issuing licenses to market operators, as well as for determining tariffs for electricity services.

Rural Electrification Authority	The Rural Electrification Authority (REA), created in 2003, is responsible for providing electricity infrastructure to rural areas and overseeing the national rural electrification strategy. Its overall goal is to increase rural electrification to 51 percent by 2030. The REA also manages the Rural Electrification Fund.
Office for Promoting Private Power Investment (OPPPI)	The OPPPI was established in 1998 to promote private sector participation in the development of power in the country. Today it is a unit of the MoE, and its mandate is to coordinate the development and implementation of projects by the private sector and manage the procurement of new infrastructure assets.
Zambia Environmental Management Agency (ZEMA)	The ZEMA is an independent environmental regulator and coordinating agency established by the Environmental Management Act (No. 12 of 2011). Its goal is to ensure the sustainable management of natural resources and protection of the environment, and the prevention and control of pollution.

Market players

National utility ZESCO dominates the Zambian electricity sector, together with the ZRA. However, the country is also home to several IPPs and private companies operating, in parallel with ZESCO, in transmission and distribution services.

Table 2: Market players

Zambia Electricity Supply Corporation Limited (ZESCO)	The Zambia Electricity Supply Corporation Limited is the state-owned vertically integrated utility company that dominates the electricity supply industry. ZESCO owns and operates the majority of generation, transmission, and distribution assets in Zambia, supplying most of the grid-connected consumers.
Zambezi River Authority (ZRA)	The Zambezi River Authority is the other state-owned corporation acting in the electricity sector. The ZRA, established by parallel legislation in the Parliaments of Zambia and Zimbabwe in 1987. It is responsible for operating and maintaining the Kariba Dam Complex, investigating, and developing new dam sites on the Zambezi River, and analyzing and disseminating hydrological and environmental information pertaining to the Zambezi River and Lake Kariba (ZRA, n. d.).
Independent Power Producers (IPPs)	Several independent power producers supply power to the grid. These include Ndola Energy (heavy fuel oil), Itezhi Tezhi (hydro), Maamba Collieries (coal), Muhanya, Bangweulu, and Ngonye (solar).
Copperbelt Energy Company (CEC)	The Copperbelt Energy Company is the larger of the two private companies operating in parallel with ZESCO in transmission and distribution services. CEC transmits and distributes electricity to Copperbelt mining companies and residential customers, and exports (wheeling) electricity to the Democratic Republic of Congo. CEC also owns 80 MW of standby generation capacity.
North Western Energy Company (NWEC)	The North Western Energy Corporation, the other private distributor, serves the mining townships of Lumwana, Kalumbila, and Kabitaka in the North-Western Province of Zambia.

Electricity market model

Zambia's electricity market is structured as a single-buyer market model with ZESCO acting as the unique off-taker and bulk retailer of electricity on the national interconnected system. These agreements mostly depend on a market guarantee in the form of state-backed contracts.

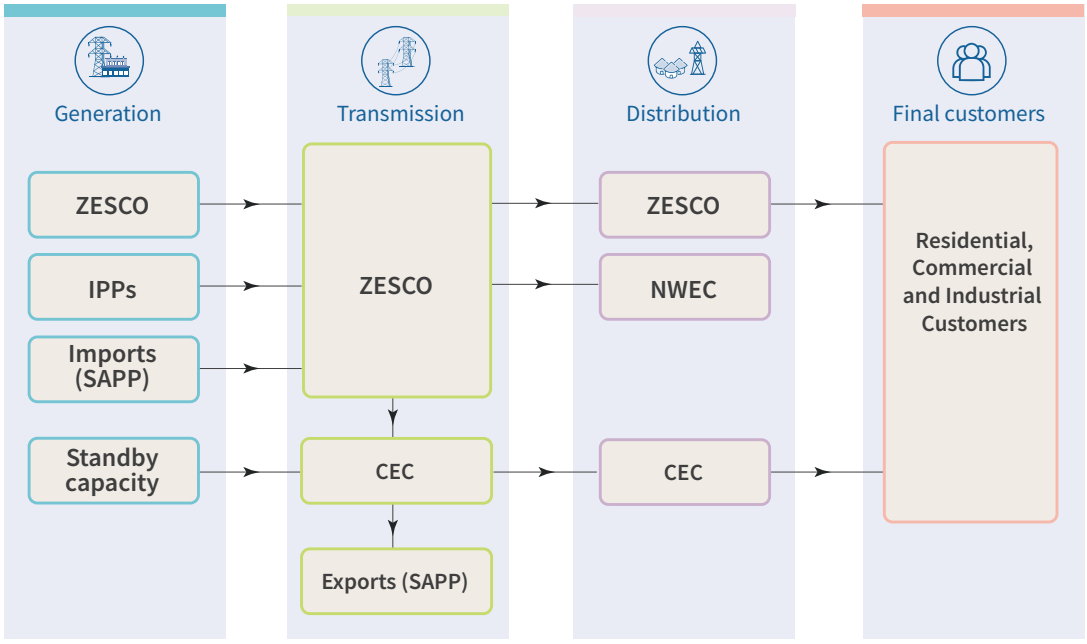
Zambia's electricity market is structured as a single-buyer market model with ZESCO acting as the unique off-taker and bulk retailer of electricity on the national interconnected system. IPPs operate their generation assets, and sell the electricity they generate to ZESCO through power purchase agreements. These agreements mostly depend on a market guarantee in the form of state-backed contracts. Currently, ZESCO Limited enters directly into power purchase agreements without government involvement (Mweemba et al., 2016). ZESCO is also responsible for operating the transmission network, ensuring the balance of demand and supply and electricity dispatching, as well as serving clients connected to its transmission and distribution networks.

A peculiarity of Zambia's electricity market model is the involvement of two private players in transmission and distribution services, the CEC and the NWEC, both operating network assets in mining provinces. Those entities operate under an exclusive regime in their areas, buying energy in bulk from ZESCO to serve their clients. The CEC manages the transmission and distribution service in the Copperbelt province supplying electricity to mining companies, corporate clients, retailers, and non-mining entities and is the single largest buyer of electricity from ZESCO. Also, CEC wheels power on behalf of ZESCO to some of ZESCO retail customers on the Copperbelt Province. The NWEC also purchases power from ZESCO under a 15-year PPA for distribution and supply of electricity to the mining townships of Lumwana, Kalumbila, and Kabitaka.

ZESCO also participates in the Southern African Power Pool (SAPP) where the majority of electricity is traded in the long-term market via bilateral contracts between the member utilities. There are also the Forward Physical Market (FPM) that are medium-term markets operating on a timescale between a week and a month, and short-term markets, namely the day-ahead market (DAM) and the intra-day market (IDM) (Owen, 2016).

A recent development has created uncertainty in Zambia's electricity sector, notably around the rules and process for declaring network assets as common carrier, as foreseen by the current national legislation. This introduced some level of ambiguity, weighing on private network operators. An exemple is the recent dispute between CEC and ZESCO, started in 2019, with respect to their bulk supply agreement (Lusakatimes, 2019) and subsequently extended also to Konkola Copper Mines (KCM), one of CEC's customers. As a consequence of the lack of an agreement between CEC and KCM for the renewal of their power supply agreement, the Minister of Energy promulgated Statutory Instrument No. 57 (SI.57), declaring CEC transmission and distribution assets 'common carrier.' This enabled ZESCO to supply electricity to KCM, wheeling on CEC network in exchange for a wheeling tariff set by the ERB. CEC appealed to the Zambian High Court against such decision and, in February 2021, the Zambian High Court ruled in favor of CEC (Reuters, 2021).

Figure 10: Structure of the electricity supply industry



2.4 Policies and regulations governing the electricity supply industry

The electricity market of Zambia is governed through numerous position papers, strategies, policy documents, and laws summarized in the next section (see Annex A for further information).

Table 3: Energy sector strategies, policies, and plans

Rural Electrification Master Plan (2008)	A national electrification plan exists in the form of a Rural Electrification Master Plan (REMP), covering the period 2008-2030. The Plan aims to raise electrification to 50 percent by 2030. This will contribute to the improvement of living standards, and a reduction in the use of wood fuels and thereby conservation of forest resources. The plan has identified 1,217 growth centers in rural areas as targets for power extension. Financing comes from the Rural Electrification Fund (REF), the Strategic Reserves Fund, Uniform Petroleum Pricing, and the Electricity Fund, in addition to appropriate donor funding windows.
Power System Master Plan (2011)	An integrated Power System Development Master Plan (PSDMP), covering the period 2010-2030, is available. The PSDMP aims to coordinate generation, transmission, and distribution expansion to ensure that all capital investments are part of a long-term structured plan (World Bank, 2017). The plan has two generation development scenarios, with both requiring roughly the same installed capacity and annual energy generation. The development plan is defined at the national level and assesses network expansion as well as grid flexibility needs.

National Climate Policy (2016)	Zambia has a general climate change policy, but it does not include GHG reduction targets. The targets spelled out in the 7th National Development Plan are not legally binding.
Renewable Energy Feed-In Tariff Strategy (2017)	The Renewable Energy Feed-in Tariff (REFiT) Strategy aims to accelerate private investments in small- and medium-sized renewable energy projects of up to 20 MW to increase access to clean energy services. This strategy supplements other government power generation investment programs contained in the Power Systems Development Master Plan and other plans.
Ministry of Energy Strategic Plan (2018)	This strategy defines the focus of the Ministry during the period 2018-2021, outlining the following strategic objectives: enhance the expansion of electricity generation, transmission, and distribution capacity; enhance cost-effectiveness and efficiency in the fuel supply through private sector participation; ensure cost-reflective pricing of energy and scale up access to electricity and petroleum products in rural areas.
National Energy Policy (2019)	The Ministry of Energy undertook a comprehensive review of the National Energy Policy in 2019. The new policy includes targets and expected reforms related to the development of the energy sector. Although it does not set legally binding targets, the energy policy explicitly acknowledges accountability as one of its guiding principles and defines an implementation plan in its Annex.

2.4.1 Key laws and regulations for the electricity market

Foundational legislation

Three major statutes currently govern the functioning of the electricity sector: the Energy Regulation Act; the Electricity Act; and the Rural Electrification Act.

The Energy Regulation Act No. 11 of 2019 repeals and replaces the previous Energy Regulation Act 1995, providing for the establishment of the Energy Regulation Board (ERB), whose primary role is to license the entities that operate in Zambia's electricity market. According to Part II, Section 4 of the Act, the ERB, in collaboration with the Competition and Consumer Protection Commission, is expected to investigate and monitor the levels and structures of competition within the energy sector. This is to promote competition and accessibility to a licensee or enterprise complying with the basic requirement for operating as a business in the Republic. The ERB shall also develop and implement appropriate rules to promote competition in the energy sector.

Furthermore, the functions of the ERB set by the Act include monitoring the efficiency and performance of licensees, determining, regulating, and reviewing charges and tariffs in the energy sector, and approving, reviewing, and regulating power purchase and supply agreements.[1] In addition, the ERB is responsible for developing operating procedures, codes of practice, guidelines for incentive-based regulation and specifications, conducting surveys, studies, training, and investigations in the energy sector, and imposing administrative penalties

1 The Electricity Act 2019 also empowers the ERB to vary the bilateral tariff in the PSA or PPA by determining a minimum bilateral tariff either at the instance of the licensee or on its own motion.

against a licensee for violation of license conditions or for failure to abide by the directives issued under this Act or any other law.

Electricity Act No. 11 of 2019 repeals and replaces the previous Electricity Act 1995, regulating the generation, transmission, distribution, and supply of electricity to enhance the security and reliability of the electricity supply within and outside Zambia. This Act defines, jointly with the Energy Regulation Act, some of the functions of the ERB, including securing a regular and efficient economical supply of electricity and facilitating universal access to electricity supply, and providing for diversity in the generation of electricity. Furthermore, the ERB is expected to facilitate the development and operation of the electricity supply infrastructure, and investment in the development, construction, and operation of electric plants using renewable energy resources.

The Rural Electrification Act No. 20 of 2003, as amended in 2021, establishes the Rural Electrification Authority (REA) whose primary role is to provide electricity to the rural areas of Zambia. Section 4 of the Act exhaustively details the functions of the Authority which include developing, implementing, and updating rural electrification master plans, mobilizing funds from within and outside Zambia in support of rural electrification, and promoting the utilization of available rural electrification technological options to enhance the contribution of energy to the development of agriculture, industry, mining, and other economic activities in rural areas. Moreover, the functions include offering, on a competitive basis, the construction of rural electrification projects, and facilitating the formation of appropriate institutions to generate, distribute or supply electricity to specific localities in rural areas.

In addition to these, Zambia has recently developed a Mini-Grid Regulatory Framework consisting of three key documents with provisions for all relevant areas of regulation for mini-grids: an Executive Summary of the Licensing and Regulatory Framework; Rules on Tariffs Applicable to Mini-Grids in Zambia; and Technical Requirements for Mini-Grid in Zambia. This framework was approved in 2018 and has since been under 'road-testing', meaning that it is yet to be gazetted.

Grid Codes and technical regulations

The Zambian Grid Code (ZGC) was issued by the ERB in 2006 and was legally enforced in 2013, after it was gazetted through Statutory Instrument No. 79 of 2013. The objective of the ZGC is to establish the obligations of all industry participants in relation to the use of the transmission system and the operation of the interconnected power system.

The ZGC consists of several sections covering different aspects of grid management. The *Governance Code* details the overall administration of the Grid Code and its review. The *Network Code* specifies the minimum technical design and operational criteria for the connection to the transmission network for generators, distributors, and end-consumers. The *Metering Code* focuses on the requirements for tariff metering at the transmission system level. The *System Operation Code* defines the responsibilities of the system operator. The *Transmission Tariff Code* defines the rules for transmission service pricing for owning, maintaining, and operating the service. Finally, the *Information Exchange Code* specifies the obligations of parties regarding the provision of information for the implementation of the ZGC.

The Zambian Distribution Grid Code (ZDGC), issued in 2016, establishes the basic rules, procedures, requirements, and standards that govern the operation, maintenance, and development of the electricity distribution systems in Zambia to ensure the safe, reliable, and efficient operation of the distribution network. The objective of the Distribution Grid Code is to promote sound planning, operational, and connection standards to provide reliable, secure, economic, and coordinated operation of the distribution system.

Tariff regulation

As per the Electricity Regulation Act 2019, the ERB is responsible for regulating and approving tariffs in Zambia's electricity sector. The Act defines the basic principles for tariff setting, the application for and approval of retail tariffs, and the multi-year and annual tariff adjustments.

The two Grid Codes define additional principles as well as the main objectives of network tariff setting. While the Grid Code provides a formula for calculating the transmission network tariff, the Distribution Grid Code states that the ERB is responsible for defining a precise methodology for distribution tariff setting.

Retail tariffs are determined based on a cost-of-service approach in line with the ERB's Electricity Tariff Determination Guidelines for Retail Customers, and are reviewed upon request from the utility.

2.4.2 Other regulation for private sector participation

Private sector participation models

The Public-Private Partnership Act No. 14 of 2009, as amended by Act No. 9 of 2018, seeks to promote the deployment of public infrastructure projects and social services through partnerships between the public and private sectors. To achieve these objectives, the Act mandates the PPP Unit within the Ministry of Finance to facilitate the participation of the private sector in the financing, construction, maintenance, and operation of any project. In addition to this, the Unit advises the Government on the administrative procedures concerning both project development and policies relating to public-private partnerships (Ministry of Finance, n. d.).

The PPP Act defines several private participation models (BOT, BOO, BOOT, etc.) but also allows for alternative arrangements. Overall, the Act promotes and enhances the transparency, fairness, and long-term sustainability of these projects. It also removes restrictions to the participation of the private sector in the provision of social services and operation and development of public infrastructure.

Procurement processes

The Public Procurement Act 2020 repeals and replaces the previous 2008 Act, establishing the Zambia Public Procurement Authority (ZPPA). The Act clarifies the ZPPA's functions and provides the framework within which public procurement is governed. It further defines the general principles of procurement, the establishment, and functions of procuring entities, as well as the procurement methods and process.

Related to the procurement method, open bidding/selection is the preferred method, which is generally applied to high-value procurements (above K500 million, or USD 28 million) while for lower value (up to K500 million) off-the-shelf purchases, a simplified process is used (ZPPA, n. d.).

The key elements of the procurement process are as follows. First is the invitation to bid, gazetted and advertised in newspapers, are open to the public and the bidding document is obtainable upon payment of a fee. The invitation has a minimum floatation period of four weeks for national tenders, and six weeks for international tenders. Subsequently, the public is invited to attend the tender closing and bid opening ceremony. There is a requirement for publication of the best-evaluated bidder before contract award. After the award of the successful bidder, a procuring entity shall inform all the other bidders that their bids have been unsuccessful, and shall give reasons for that decision.

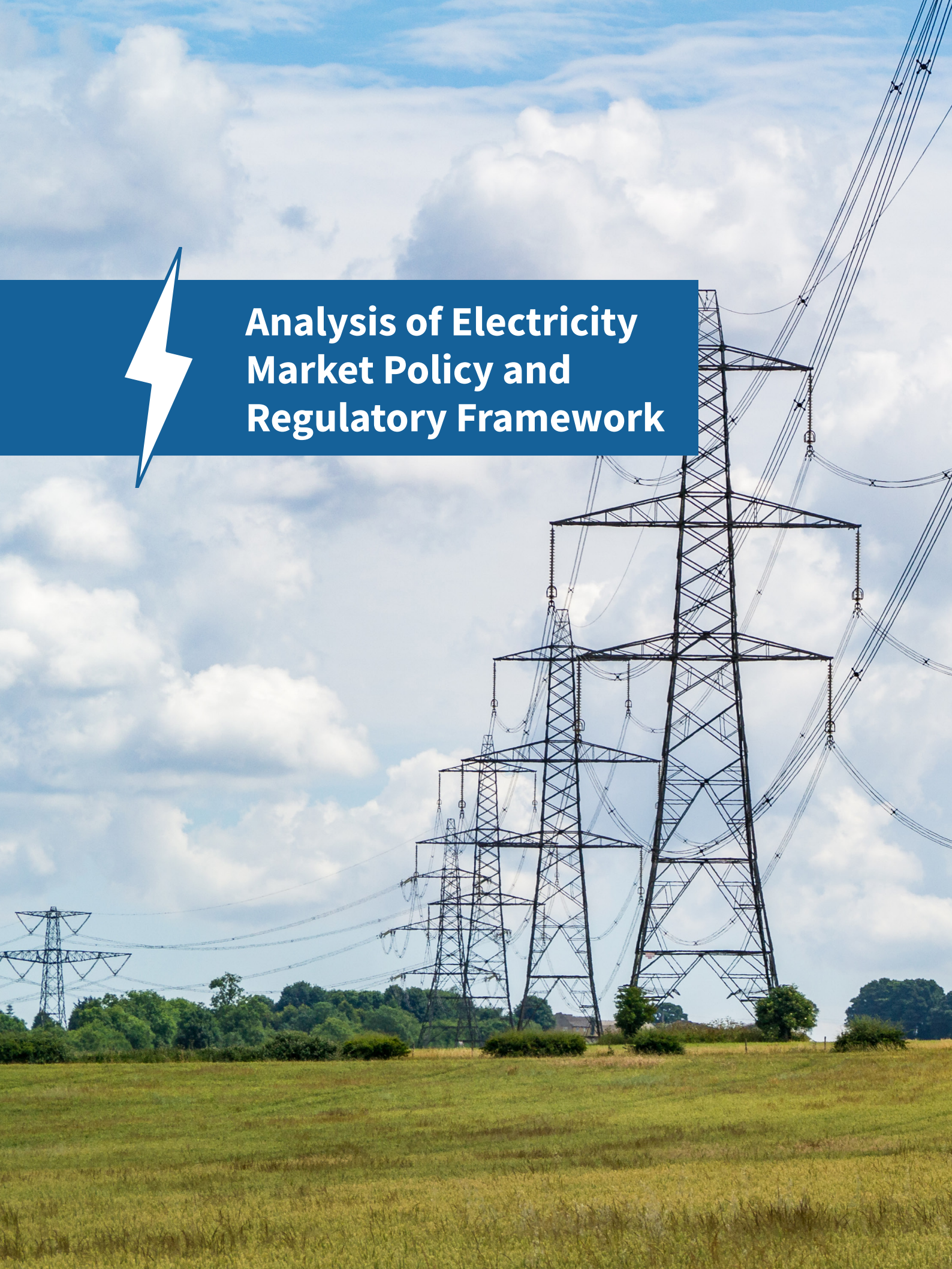
Incentives

Incentives for investments are provided through the Zambia Development Agency (ZDA), which is a statutory agency established under the ZDA Act No. 11 of 2006 and falling under the Ministry of Commerce, Industry and Trade. The ZDA's objective is to foster the country's economic development by promoting efficiency, investment, and competitiveness in business and exports. Furthermore, the Agency offers a wide range of incentives in the form of allowances, exemptions, and concessions for companies. The Act provides for investment thresholds to qualify for fiscal and non-fiscal incentives.

Investors who invest a minimum of USD 500,000 in the Multi-Facility Economic Zones (MFEZ) *or a priority sector or product* as defined under the ZDA Act, are entitled to fiscal incentives in the form of import duty relief and accelerated depreciation on capital equipment and machinery including trucks and specialized motor vehicles for five years.

In terms of non-fiscal incentives, investments of at least USD 250,000 in a Multi-Facility Economic Zone, an Industrial Park, a Priority Sector, or a Rural Enterprise as defined under the ZDA Act, are entitled to investment guarantees and protection against state nationalization, and free facilitation of applications for immigration permits, secondary licenses, land acquisition, and utilities.

Analysis of Electricity Market Policy and Regulatory Framework



Pylons carry high voltage electricity power lines
Photo credit: J R Patterson

3. Analysis of Electricity Market Policy and Regulatory Framework

UNECA and RES4Africa Foundation have developed a custom methodology to assess countries' policy, legislative, and regulatory frameworks in their ability to encourage the participation of private sector investors. The approach encompasses the entire electricity supply industry value chain, covering the generation, transmission, distribution, and off-grid segments of the market.

3.1 UNECA and RES4Africa methodological approach

The methodology identifies three areas, referred to as Dimensions, under which policy, legislative, and regulatory elements are clustered. These Dimensions are as follows.

Openness

Openness – or power sector structure and governance. This Dimension covers policies, laws, and regulations meant to define energy policy and strategy priorities, market-entry, infrastructure planning, sector governance, market structures, and related considerations. These instruments combined provide an overall view of the *openness* of the electricity market to investors.

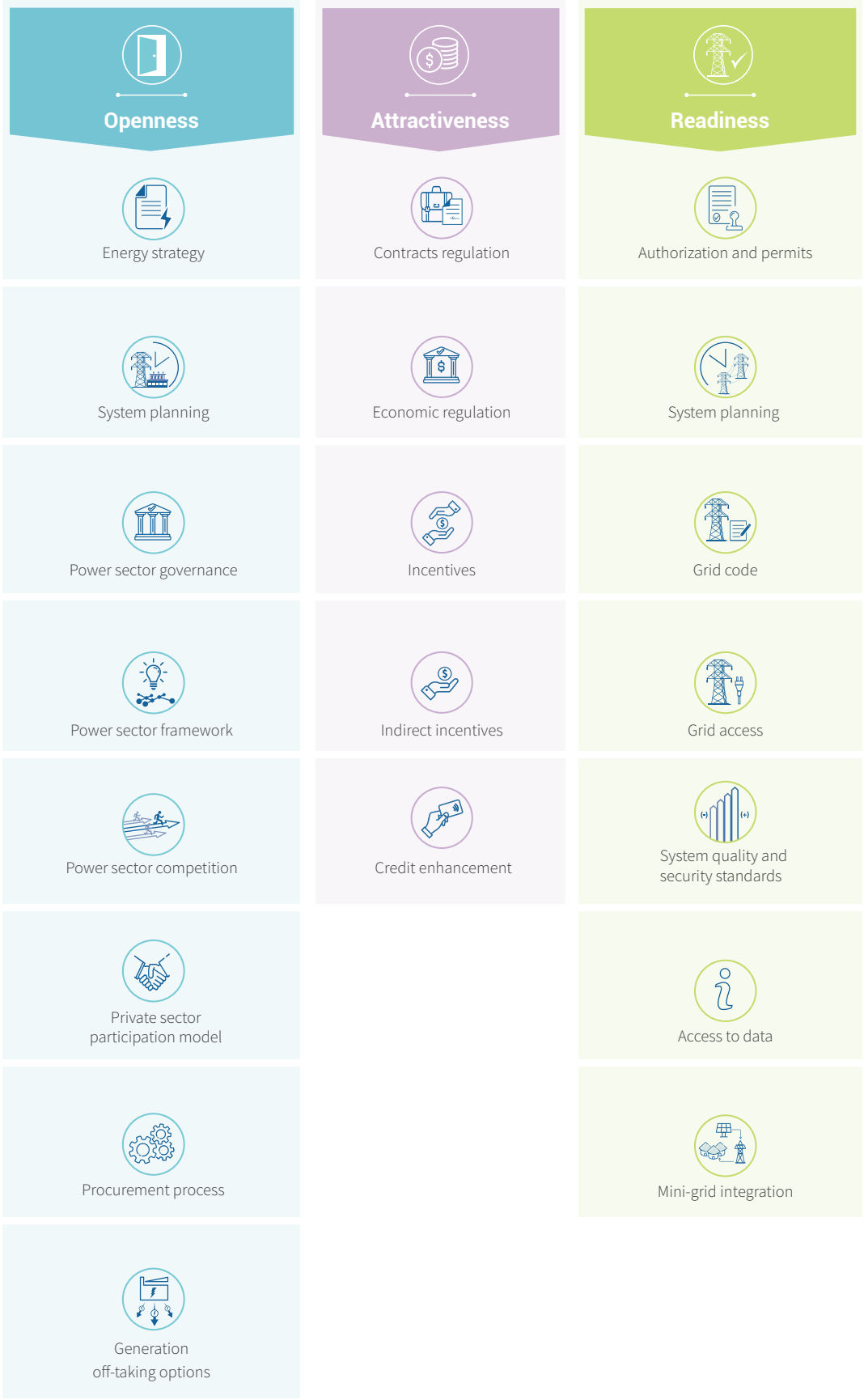
Attractiveness

Attractiveness – or sector economics. This Dimension assesses policies, laws, and regulations that ensure the economic viability of electricity infrastructure investments, as well as fair competition among market operators. A review of these instruments provides an overall synthesis of the *attractiveness* of the electricity market to private sector investors.

Readiness

Readiness – or sector maturity. This Dimension investigates technical regulations designed to ensure the implementation into, and efficient integration and management of electricity infrastructure within the energy system. A review of these elements of the Dimension provides an overall picture of the *readiness* of the electricity market to investors along the value chain.

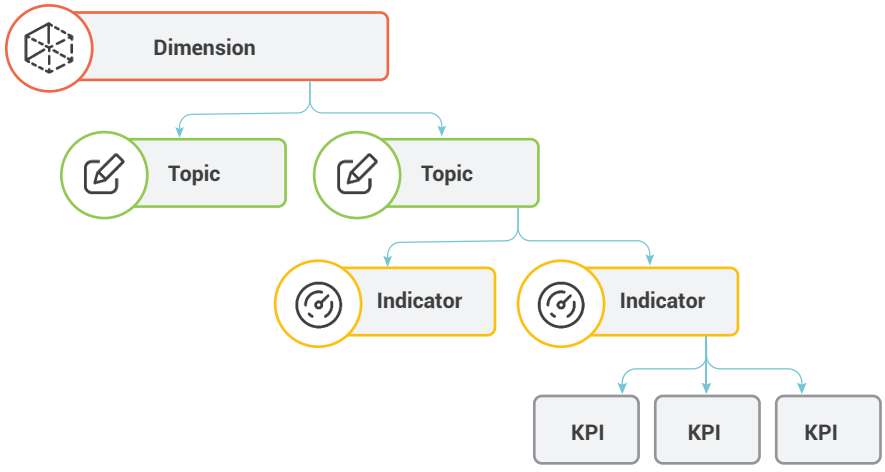
Figure 11: Overview of the Topics assessed within each Dimension



Each of these Dimensions is then disaggregated into three further levels, namely Topics, Indicators, and KPIs (key performance indicators).

- **Topics (1st Level)** define the main areas of policy and regulatory assessment (such as energy strategy, system planning, and grid code) specific to each of the Dimensions. Topics are composed of Indicators. See Annex B for an overview of the Topics assessed.
- **Indicators (2nd Level)** cover single policy or regulatory elements (such as energy policy, Electricity Act, public PPAs, retail tariff structure, and grid connection). Each Indicator is composed of a series of KPIs.
- **KPIs (3rd Level)** are single elements, or specific questions, that provide a detailed understanding of Indicators, which in turn inform Topics.

Figure 12: Methodological building blocks



The methodology, cascading from the broader to the micro-level, enables proper assessment and understanding of the degree of *openness, attractiveness, and readiness* of electricity markets to private sector investors. This approach led to the formulation of a set of questionnaires – one for each segment of the electricity market, that is generation, transmission, distribution, and off-grid. Based on YES/NO questions, the approach enables the assessment of the policy, legal, and regulatory environment related to its fundamental attributes: clarity, predictability, transparency, and accountability.

The quantitative result from this methodological exercise is estimated by summing the positive (YES) answers to the detailed questions (KPIs). To reflect on the relative relevance of a particular KPI under a given Indicator, and to assess the impact that a particular Indicator has on its Topic, Indicators, and KPIs are subjected to relative weights on a scale system. The weights were reviewed and validated by a panel of African and international experts, and reflect the average input of the experts.

To compute the necessary quantitative results based on data input from countries, UNECA and RES4Africa developed the ROAR (Regulatory review of the *openness*, *attractiveness*, and *readiness*) tool. The ROAR tool computes results by country based on country data inputs and a defined weighting methodology.

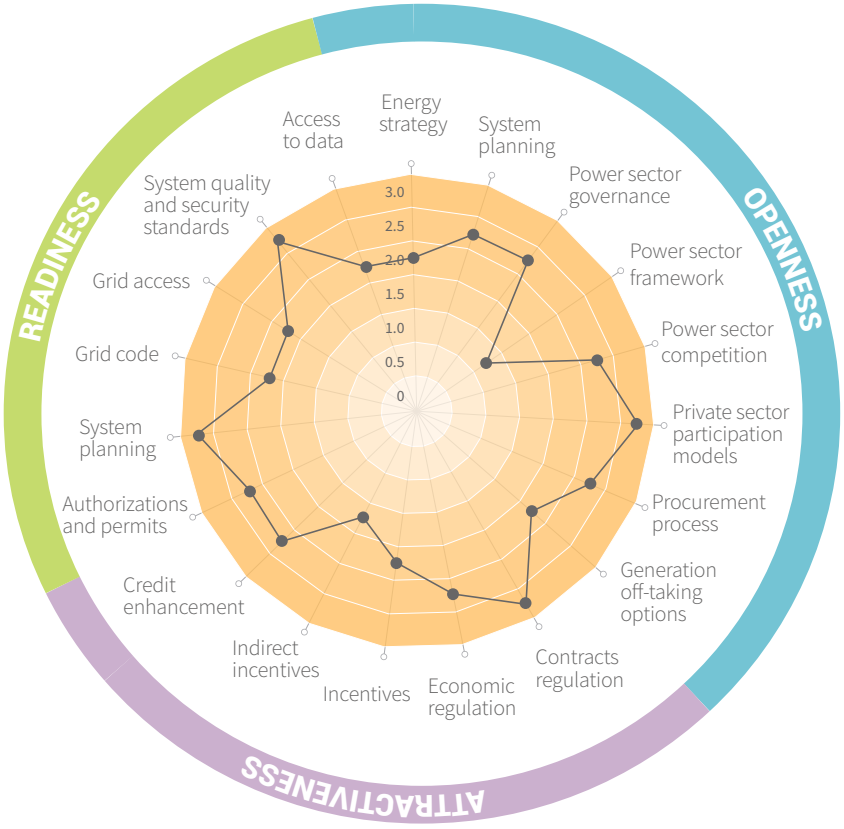
The quantitative results, therefore, are presented at the Topics level and use a scoring system based on a 0 to 3 point scale, where 0 is the lowest score – indicating a lack of regulatory preparedness on the assessed Topic related to private sector investment participation – and 3 is the highest – indicating a full regulatory preparedness on the assessed Topic.

3.2 Main findings

The section below presents the quantitative results of the performed assessment of Zambia's electricity policy and regulatory framework related to the crowding-in of private investors to the electricity market.

3.2.1 Generation segment

Figure 13: Overview of the generation segment

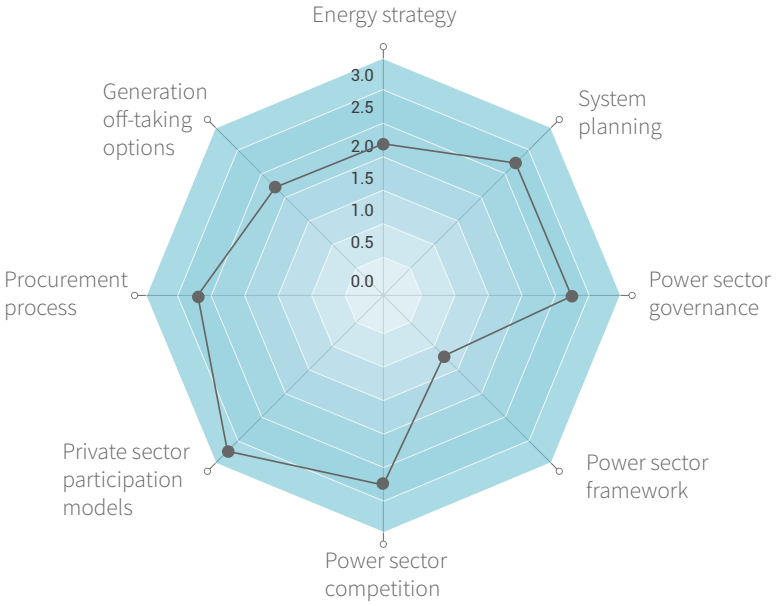


Overall, Zambia's performance is satisfactory in most of the Topics assessed under the three Dimensions – *openness*, *attractiveness* and *readiness* – related to the generation segment. These results confirm the preparedness of national policy and regulatory framework in enabling private sector participation in the generation market. Zambia performs outstandingly in key Topics such as *private sector participation models* in the *openness* Dimension and *contracts regulation* in the *attractiveness* Dimension.

However, Zambia still faces shortcomings in key policy and regulatory areas such as the adequacy of the *energy strategy*, the *power sector framework,* and the *generation off-taking options* in the *openness* Dimension. In the *attractiveness* Dimension, the Topics regarding *incentives* are a key area of improvement, while in the *readiness* Dimension, *access to data*, *grid access,* and the *grid code* are the main regulatory gaps.

A deep dive into the Openness dimension

Figure 14: A deep dive into the Openness dimension for generation



Overall, the Topics within the *openness* Dimension demonstrate high regulatory performance, with the exception of *energy strategy, power sector framework*, and *generation off-taking options*.

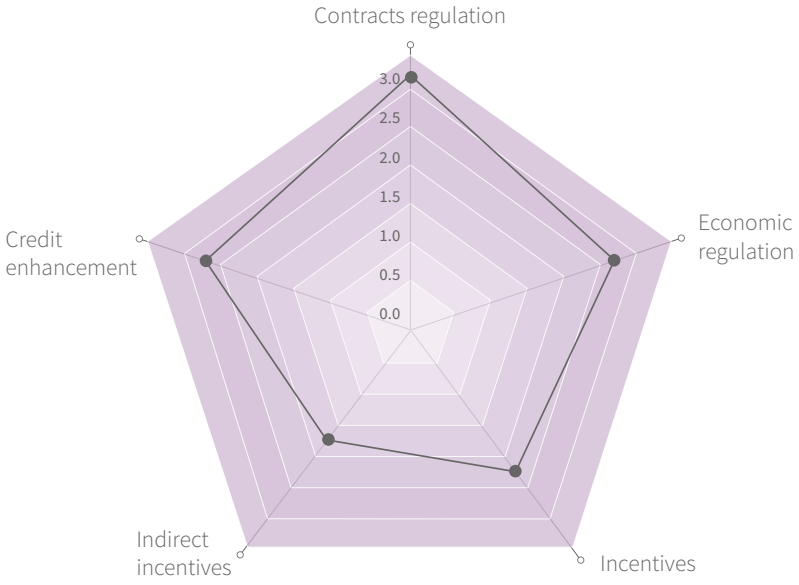
Energy strategy	The Ministry of Energy recently issued a reviewed Energy Policy (2019), setting the strategic goals in terms of electricity sector development and outlining forthcoming reforms. The policy defines a roadmap for reforms to be implemented between 2020 and 2025, which would help in monitoring the progress and increase accountability. However, there are gaps related to monitoring procedures, which remain insufficiently implemented. In addition, the publicly available National Climate Change Policy is based on indicative targets, spelled out in the 7th National Development Plan 2017-2021. The lack of legally binding targets and effective monitoring framework explain the moderate level of regulatory performance under the *energy strategy* Topic.
System planning	Zambia performs well in *system planning* due to the presence of an integrated electricity infrastructure development plan (2010-2030), which is publicly accessible. The master plan defines least-cost generation capacity expansion scenarios based also on renewable energy sources (RES) potential. However, it does not detail project pipelines for investment.

 Power sector governance	Zambia also performs well related to *power sector governance* due to the presence of the Electricity Act, 2019, as the governing law for Zambia's electricity supply industry-defining electricity services providers' rights and obligations, license requirements, national regulator mandate, and powers, among others. The Energy Regulation Act, 2019, completes the Act by renewing the role of the ERB as the national regulatory authority for the sector, with competencies on licenses, economic and technical regulation. However, the lack of adequate autonomy for the ERB, related to financial and political independence, remains a sector governance challenge.
 Power sector framework	The market structure is organized under a single-buyer model, where the public utility - ZESCO - remains vertically integrated. Neither vertical nor horizontal unbundling is implemented yet, thus reducing the openness of market structure for private entities and explaining the low performance related to *power sector framework*. Despite such a vertical structure of Zambia's electricity market, the presence of two operators, CEC and NWEC, responsible for transmission and distribution within their assigned areas has to be acknowledged.
 Power sector competition	Zambia's electricity market is open to competition at the generation and wholesale level, through IPPs selling to ZESCO, or directly to final bulk users. CEC and NWEC benefit from the exclusive right to transmit, distribute, and sell electricity to final clients within their region. ZESCO, CEC, and NWEC are the only operators serving domestic final users, and the retail market remains closed to competition between suppliers. This constitutes an area of potential regulatory improvement.
 Private sector participation model	As defined by the PPP Act 2009, private sector participation is allowed through concession arrangements, merchant plants, and divestiture models, demonstrating high regulatory performance of Zambia in this area. The most frequent models for private participation include private-public-partnership (PPP) where the government participates through the Industrial Development Corporation (IDC), Independent Power Producer (IPP) with power supply agreements with the public utility ZESCO, and IPP with its own captive market.
 Procurement process	The good performance in this Topic are due to the Public Procurement Act, as amended in 2020, and the Public-Private Partnership Act, as amended in 2018. While the first establishes the ZPPA's functions, provides the framework within which public procurement is governed and the functions of procuring entities, as well as the procurement methods and process, the PPP Act removes restrictions to the participation of the private sector in the provision of social services and operation and development of public infrastructure and defines several private participation models (BOT, BOO, BOOT, etc.) but also allows for alternative arrangements. Both competitive solicited and unsolicited proposals are possible to procure new infrastructure, however are used case by case without a public schedule of the procurement project pipeline. In terms of public procurement of electricity infrastructures, OPPPI (Office for the Promotion of Private Power Investment), a dedicated department of the Ministry of Energy, is in charge of this process of running bidding process.

Generation off-taking options	Generators have access to several routes-to-market for selling their electricity output, both centralized (access to the SAPP, public PPAs with the single buyer) and decentralized (private PPAs, and self-consumption options). However, the lack of clear regulation on wheeling conditions and authorizations hinders the development of the decentralized models, thus explaining the moderate regulatory performance related to *generation off-taking options*.

A deep dive into the Attractiveness dimension

Figure 15: A deep dive into the Attractiveness dimension for generation



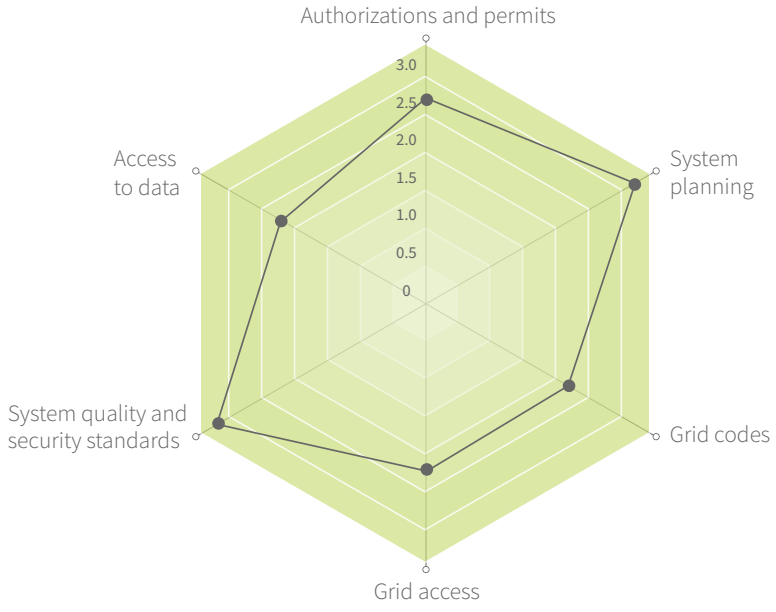
Overall, the performance of Zambia in the *attractiveness* Dimension is high, with the exception of *incentives* and *indirect incentives* which would require some improvements.

Contracts regulation	Zambia has been able to attract several private investors in the generation segment, where standardized PPAs are available and are used in the competitive tendering process. The ERB's power purchase and supply agreements regulatory guidelines outline all requirements. The PPAs include provisions on inflation indexation, foreign currency, force majeure, and dispute resolution mechanisms, demonstrating high regulatory performance related to *contracts regulation*.
Economic regulation	As per the Electricity Regulation Act 2019, the ERB is responsible for regulating and approving tariffs in Zambia's energy sector. The Act defines the basic principles for tariff setting, the application for and approval of retail tariffs, the minimum bilateral tariff, and the multi-year and annual tariff adjustments. While ERB has Electricity Tariff Determination Guidelines for Retail Customers, tariffs are still not covering service costs, leading to gaps in Zambia's regulatory performance related to *economic regulation*.

Incentives	Several incentives are available for renewable generators, as feed-in-tariffs (for small hydro plants up to 20 MW) and dedicated auctions for renewable developers, as stated by the REFiT Strategy, 2017. Capacity payment component is included in PPAs. There is a public schedule for centralized renewable energy (RE) capacity procurement; however, the dedicated REFiT's supporting mechanisms were unique to the procurement under the strategy. Moreover, alternative supporting schemes such as green certificates and renewable portfolio standards are also missing, leading to moderate regulatory performance related to *incentives*.
Indirect incentives	Zambia extends *indirect incentives* to generation investors in the form of tax reliefs and VAT reductions for electricity plant components and machinery, which are made available by the ZDA. Oher indirect incentives such as carbon tax or direct subsidies are not currently available, therefore leading to moderate regulatory performance related to incentives.
Credit enhancement	The attractiveness of generation investment in Zambia is enhanced by the presence of several credit enhancement instruments in the form of revenue escrow agreements, sovereign guarantees, multilateral guarantees, and concessional lending from international institutions are offered to generators.

A deep dive into the Readiness dimension

Figure 16: A deep dive into the Readiness dimension for generation

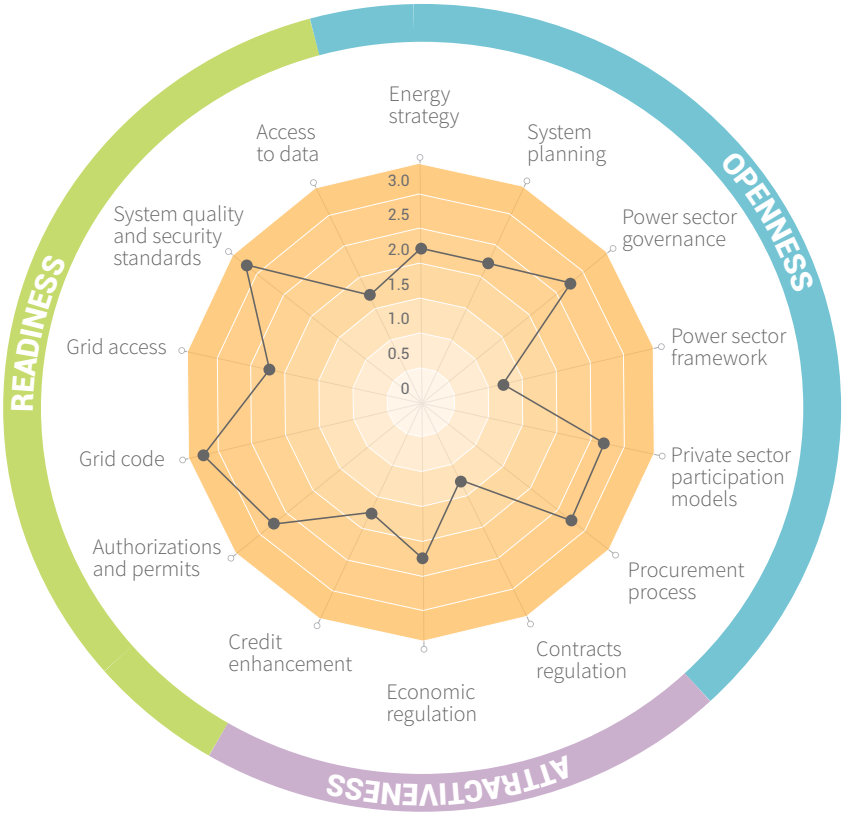


The performance of Zambia in the *readiness* Dimension is high, with some Topics, such as *system planning* and *system quality* being areas of high performance, while others require improvements.

 Authorization and permits	Rules for access to land, water rights, and construction and environmental permits are defined and are accessible to private players through the Ministry of Lands and Natural Resources, the Water Resource Management Authority, the National Council for Construction, and the Zambia Environmental Management Agency, respectively. Also the National Heritage Conservation Commission is required to give a no objection for development in an area that is designated as a heritage site (National Parks, culturally important sites, and water falls). The legislation in force defines dedicated issuing institutions for all relevant permits and authorizations. While these are major progress related to authorizations and permits, the lack of a one-stop-shop for accessing these services hinders better regulatory performance on this Topic.
 System planning	The electricity sector of Zambia is guided by effective *system planning* which benefits from the presence of network infrastructures development plan, for both transmission and distribution, inside the current integrated Power System Development Master Plan.
 Grid code	The ZGC, 2013, establishes the rules for the governance, operation, and connection to the interconnected transmission system and service. While Zambia's Grid Code provides regulatory certainty in key areas of market operation, there is need to establish dispatching rules, clarify priority dispatch to renewables, and dedicated curtailment management rules to close the current regulatory gaps.
 Grid access	The Electricity Act 2019, and the ZGC 2013, ensure open access to the network for generators and suppliers. The transmission tariff sub-code of the Grid Code defines the rules for connection charges. However, grid connection agreements are still negotiated bilaterally with the network operator. The lack of a standard framework for connection agreements explains the moderate regulatory performance related to *grid access*.
 System quality and standards	System quality and security standards are used for the planning and operation of the transmission network. The electricity market of Zambia is guided by a fully developed and operational system quality and security standards.
 Access to data	Socio-economic and electricity market data is published by the Zambia Statistics Agency and the ERB. Audited financial statements from the public utility are included in ZESCO's integrated reports and made available on ZESCO website but not updated to last fiscal year (last available publication refers to year 2018). Addressing this gap would enhance market transparency.

3.2.2 Transmission segment

Figure 17: Overview of the transmission segment

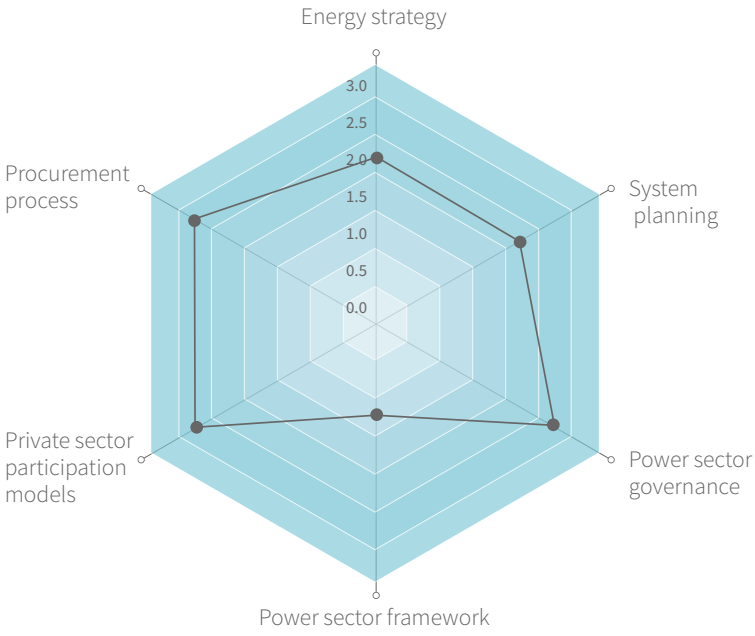


Unlike many countries in Sub-Saharan Africa, Zambia provides for the possibility to crowd-in the private sector not only in the generation, but also in the transmission segment of the electricity value chain. The current legislation allows private parties to obtain a license from the ERB to operate transmission assets. This is also reflected in the results of the regulatory assessment related to *private sector participation models* and *procurement process*. On the other hand, Topics related to *power sector framework*, *contracts regulation*, and *access to data* demonstrate the need for further regulatory improvement to enhance the overall regulatory environment for transmission investors.

In this section, the analysis focuses on those Topics that differ significantly from those covered under the generation segment. For more details on recurring Topics, refer to the comments provided in the related section for the generation segment.

A deep dive into the Openness dimension

Figure 18: A deep dive into the Openness dimension for transmission



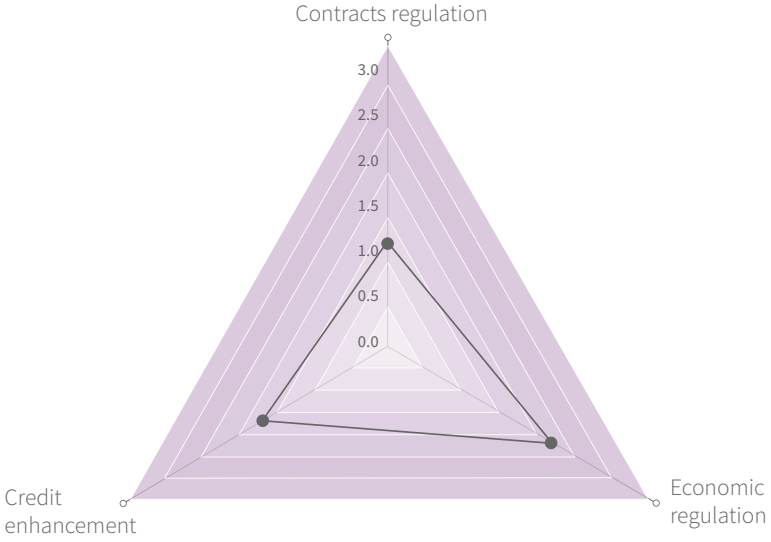
The performance of Zambia in the *openness* Dimension is variable, with some Topics, such as *procurement, system planning, power sector governance* and *private sector participation model* being areas of high performance, while others require improvements.

System planning	The available integrated electricity infrastructures development plan 2010-2030 covers generation, transmission, and distribution infrastructures expansion and defines a preferred scenario, based on a least-cost approach. The ZGC has a dedicated section on network investment criteria (8.3.6 Least economic cost criteria). While the presence of such plans enhances the *openness* of the market segment, lack of associated investment plan for transmission assets, detailing medium-term project pipelines for investments, explains the moderate performance related to *system planning*.
Power sector governance	The 2019 Electricity Act and the Energy Regulation Act enable private sector participation in the transmission segment with no particular restrictions other than obtaining a license. Private players are allowed to invest and operate a transmission network, such as the CEC, and the rules for obtaining a license from ERB are well defined.
Private sector participation model	Private sector participation in the transmission segment is possible through several models (the whole of grid concession, merchant, independent power transmimssion (IPT), and engineering, procurement, and construction (EPC), demonstrating high regulatory performance. Divestiture model is, however, not permissible.

Procurement process	The good performance in this Topic are due to the Public Porcurement Act, as amended in 2020, and the Public-Private Partnership Act, as amended in 2018, which also consider public procurement of new electricity transmission infrastructures.

A deep dive into the Attractiveness dimension

Figure 19: A deep dive into the Attractiveness dimension for transmission



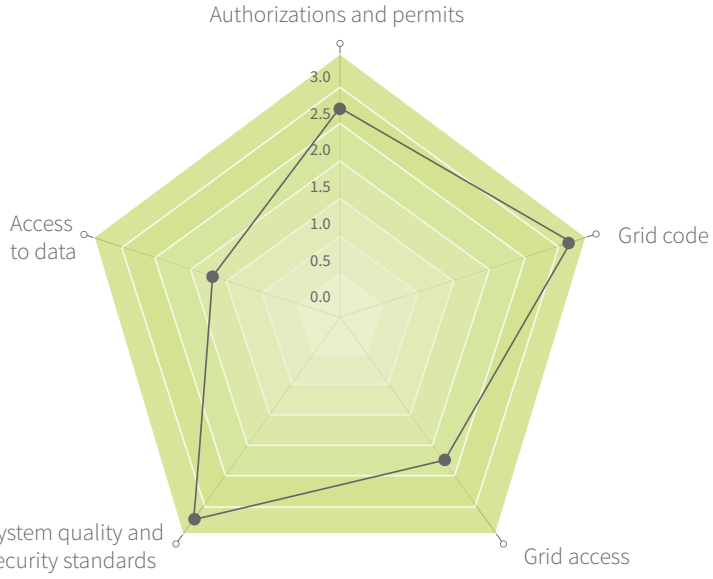
Zambia's mitigated performance in the Topics covered by the *attractiveness* Dimension, especially regarding the *contracts regulations* Topic, related to the transmission segment reflects the lack of clarity about rights and obligations of transmission service providers.

Contracts regulation	Standard license regime for a transmission service provider is available. However, the low performance in *contract regulation* is mainly due to the lack of clarity about rights and obligations of transmission service providers defined by such license regime, especially in view of the common carrier regime introduced by Electricity Act, 2019. For example, the CEC operates a privately owned transmission network and benefits from a transmission license. However, the license is not publicly available. It is, therefore, not possible to evaluate its ability to cover relevant aspects such as economic compensation, performance evaluation, and termination provisions.
Economic regulations	The network tariff and wheeling charges require regulatory approval from the ERB and are regulated by a dedicated sub-code in the Grid Code, which outlines a clear tariff setting methodology. However, tariff regulation is not cost-based, thus risking the non-coverage of the cost of the transmission service. It also lacks a fair implementation of the multi-year price review mechanism, which motivates the moderate performance of this Topic.

Credit enhancement	Several credit enhancement instruments are made available for private investors in transmission assets, mainly through concessional lending and multilateral guarantees made available from development partners. Direct support from the government in the form of public guarantees is, however, unavailable as for now, explaining the moderate regulatory performance in this Topic.

A deep dive into the Readiness dimension

Figure 20: A deep dive into the Readiness dimension for transmission



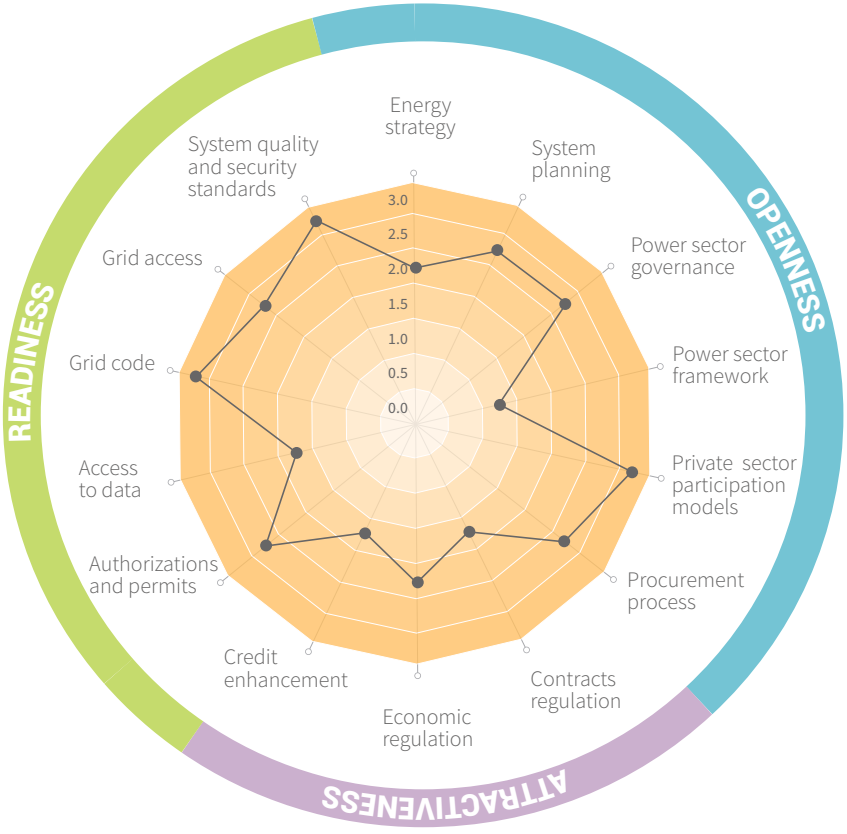
Two of the five Topics covered under the *readiness* Dimension in the *transmission* segment received the maximum score, while others require improvements.

Authorizations and permits	In addition to the regulatory aspects evaluated in the *generation* segment of the analysis, rules concerning the right-of-way, which are crucial for the construction of transmission infrastructure, are defined by the Electricity Act 2019. As a consequence, Zambia performs well related to authorization and permits.
Grid code	The ZGC 2013 establishes the rules for the governance, operation, and connection to the interconnected transmission system and service. The extended coverage of the ZGC and ERB's regulatory oversight of transmission service operators demonstrate regulatory *readiness* related to *grid code*.

Grid access	The Electricity Act 2019 and the ZGC 2013 ensure open access to the network for generators and suppliers. The transmission tariff sub-code of the Grid Code defines the rules for connection charges. However, grid connection agreements are still negotiated bilaterally with the network operator. The lack of a standard framework for connection agreements explains the moderate performance related to *grid access*.
System quality and standards	System quality and security standards are extensively defined by the national grid code. The regulatory framework is ready to provide guidance on system quality and security to transmission system operators.
Access to data	Socio-economic and power market data is published by the Zambia Statistics Agency and ERB. However, data on dispatching and quality of transmission service is not disclosed, which makes *access to data* an area of improvement to enhance market transparency.

3.2.3 Distribution segment

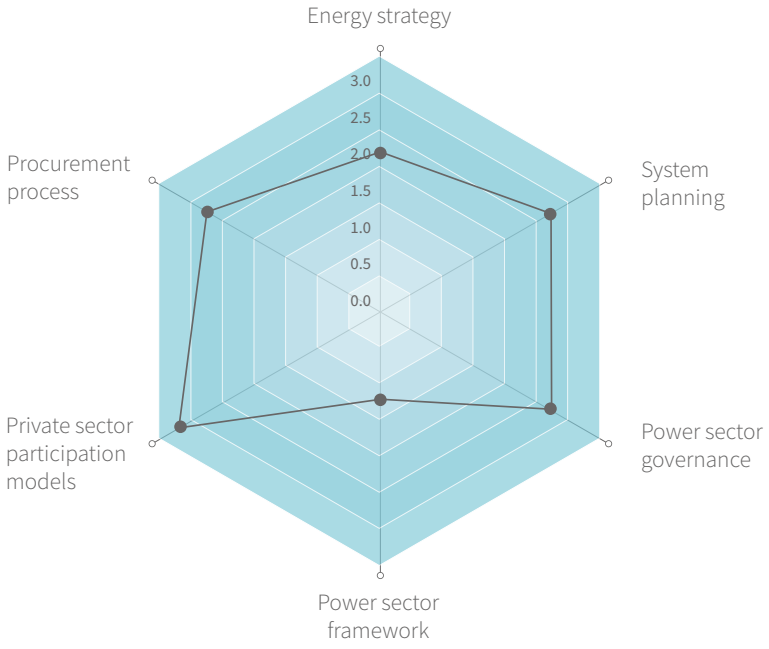
Figure 21: Overview of the distribution segment



Overall, the policy and regulatory framework related to the distribution segment ensures a fair level of *openness*, *attractiveness,* and *readiness* to interested private sector investors. Zambia's distribution service is open to private sector participation. Two private distributors, CEC and NWEC, serve industrial, commercial, and residential clients in exclusive zones through their networks. This is well reflected by the excellent performance related to *private sector participation models*. Zambia achieves highest performance in the *grid code* Topic thanks to the presence of a national distribution code, approved by the ERB. Key areas of regulatory improvement relate to *power sector framework*, *contracts regulation*, *credit enhancement*, and *access to data*.

A deep dive into the Openness dimension

Figure 22: A deep dive into the Openness dimension for distribution



Overall, the performance of Zambia in the *openness* Dimension is high, with the exception of *power sector framework* which received the minimum score thus requiring some improvements. The section below focuses on the main findings of the review of Topics relevant for the *openness* Dimension. Only the elements relevant for the distribution segment are highlighted in the section. For a more extended review of all the Topics, refer to the discussions under *Generation–Openness* and *Transmission–Openness*.

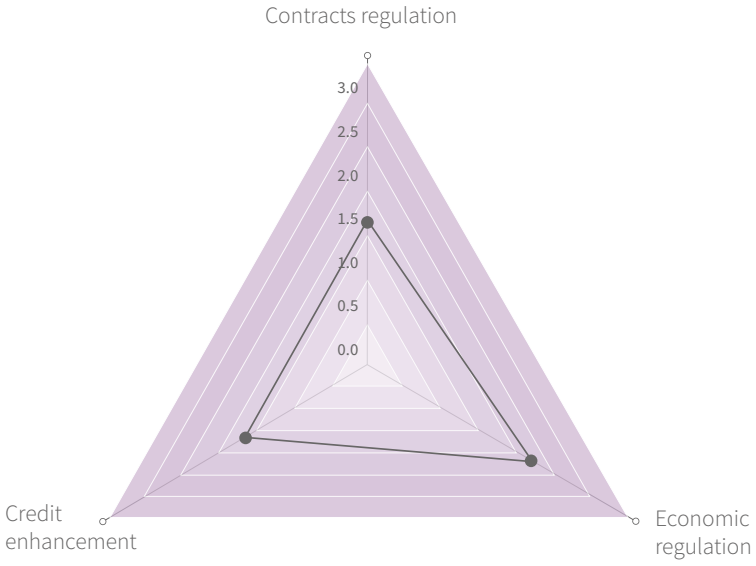
System planning

Similar to the other segments, the very good performance related to *system planning* relates to the presence of the Power System Development Master Plan (2010- 2030). Furthermore, Zambia benefits from the specificities of its distribution grid code, providing guidelines on the distribution investment evaluation process and methodology to be applied by ERB. A Rural Electrification Masterplan completes the picture of planning documents for electrification expansion.

	Addressing the gaps related to a detailed investment plan for distribution assets, detailing medium-term project pipelines for investments, would further enhance the *openness* of the distribution segment of the market.
Power sector governance	The Electricity Act allows private players to invest in distribution assets and operate as distributors, as well as electricity retailers. This is well reflected by the presence of CEC and NWEC, which operate distribution networks, benefitting from the exclusive right to serve final users connected on their grids in their respective areas. Operators interested in providing distribution services need to obtain a license from the ERB. Governance would be further enhanced with adequate autonomy of the ERB from financial dependence and potential political interference.
Private sector participation model	Zambia's electricity distribution segment is open to the private sector, leading to high regulatory performance related to *private sector participation model*. CEC and NWEC both own private distribution networks and benefit from distribution licenses to serve final clients in their respective exclusive regions. Private sector participation in the distribution segment is also permitted through privatization. Furthermore, private companies could participate in distribution asset development through EPC contracts.
Procurement process	PPP agreements are potentially available for investors in distribution infrastructure. The PPP Act 2018 regulates such agreements and defines public procurement procedures. Therefore, Zambia has instituted an effective procurement process for distribution investors. Public tendering have not been used so far for procuring new distribution assets.

A deep dive into the Attractiveness dimension

Figure 23: A deep dive into the Attractiveness dimension for distribution

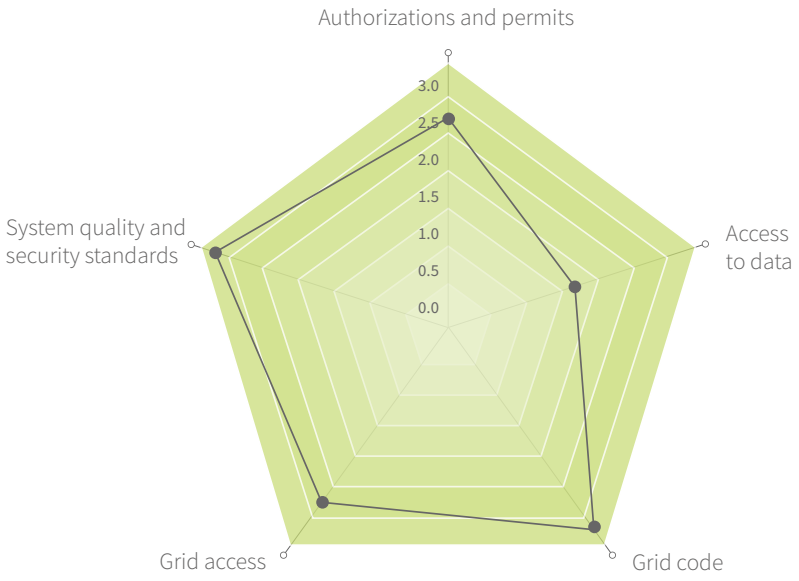


Two of the three Topics covered under the *attractiveness* Dimension in the distribution segment require improvements, while *economic regulation received a medium score.* The section below focuses on the main findings of the regulatory review related to *attractiveness* of the distribution segment of the market to private investment. Only the elements relevant for the distribution segment are highlighted in the section. For a more extended review of all the Topics, refer to *Generation–Attractiveness* and *Transmission–Attractiveness*.

 Contracts regulation	The regulatory environment demonstrates moderate performance related to *contract regulation*. A standardized distribution license is available for distribution service providers. The distribution grid code further specifies obligations and rights in terms of network performances, metering, and payment collection. However, the lack of an open access to licenses made it impossible to define if they cover fundamental aspects related to dispute resolution mechanisms or termination provisions; areas of importance to interested private players.
 Economic regulations	E*conomic regulation* contributes to the overall *attractiveness* of the distribution segment of the market. The presence of a dedicated sub-code dealing with distribution tariff (Distribution Tariff Chapter) in the ZDGC demonstrates advancement in economic regulation. The sub-code sets the principles and the main objectives of network tariff setting. The tariff code applies to energy charges, network charges (including ancillary services, and customer services charges. The ERB shall regulate the price setting and the tariff structure for all distribution-related services. Addressing the application of a periodical tariff revision would further enhance Zambia's performance related to *contract regulation*.
 Credit enhancement	Credit enhancement instruments, made available notably by multilateral entities, are available for distribution investors. However, government support through dedicated public guarantees is not available for private-led distribution investments, explaining the moderate performance in the related Topic.

A deep dive into the Readiness dimension

Figure 24: A deep dive into the Readiness dimension for distribution



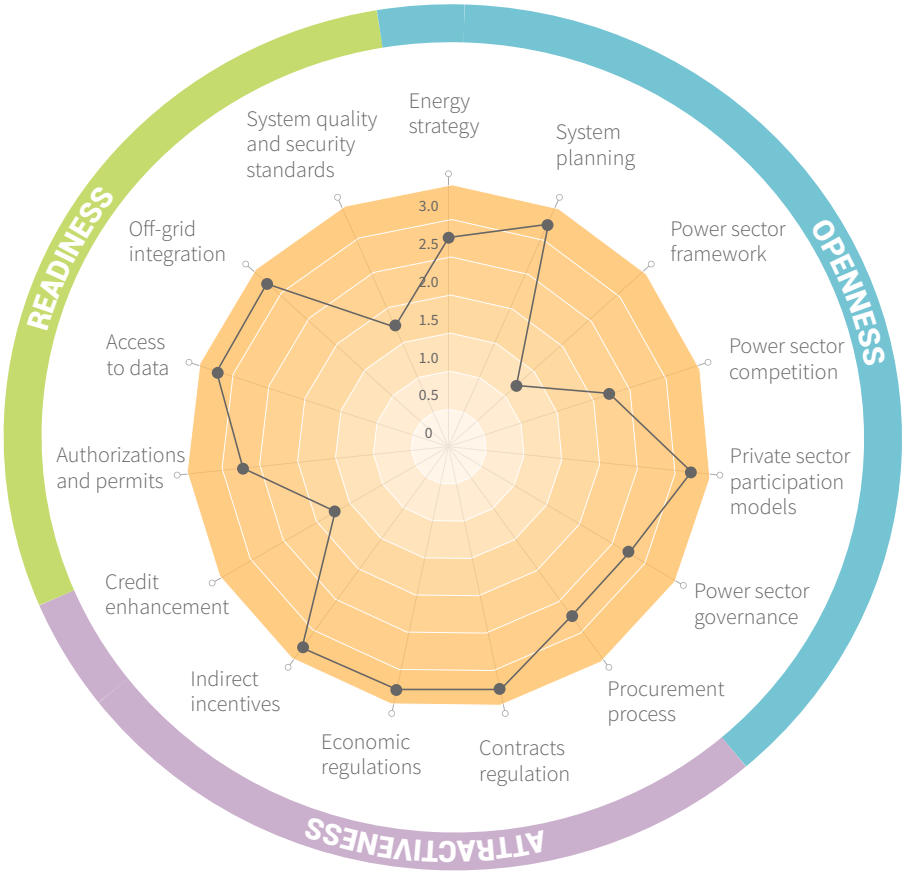
Overall, the performance of Zambia in the *readiness* Dimension is high, with the exception of *access to data* which would require some improvements. The section below focuses on the main findings of the review of Topics relevant for the *readiness* Dimension. Only the elements relevant for the distribution segment are highlighted in the section. For a more extended review of all the Topics, refer to *Generation– Readiness* and *Transmission– Readiness*.

Grid code	The presence of the distribution grid code (ZDGC), issued by the ERB, provides regulatory clarity on the operation of distribution services. The ZDGC establishes the basic rules, procedures, requirements, and standards that govern the operation, maintenance, and development of the electricity distribution systems in Zambia. It details rules to promote sound planning, operational standards of the distribution systems, including minimum requirements for tariff, metering and energy trading metering installations. It furthermore defines open access regime for all network users (loads and demand points), set connection agreement requirements and procedures as well as rules defining the allocation of connection charges. This is recognized through superb regulatory performance related to this Topic.
Grid access	The ZDGC ensures open access regime to be ensured by distribution operators to all users, both load and demand connections, as also specified in the Electricity Act 2019.Furthermore, it sets connection agreement rules and defines rules for connection charges. Connection tariff remains to be set by the ERB. There is a regulatory gap related to a standard contractual framework for connection agreements. Addressing this gap will further enhance the *readiness* of the distribution segment of the market.

System quality and standards	The distribution grid code defines technical requirements, including quality of supply and security standards, in its network and system operating chapters. In this regard, the regulatory environment of Zambia demonstrates high level of *readiness.*
Access to data	Socio-economic and power market data are published by the Zambia Statistics Agency and ERB. There is a gap in the disclosure of data related to quality of distribution services. Addressing it would enhance transparency in the distribution segment of the market.

3.2.4 Off-grid segment

Figure 25: Overview of the off-grid segment

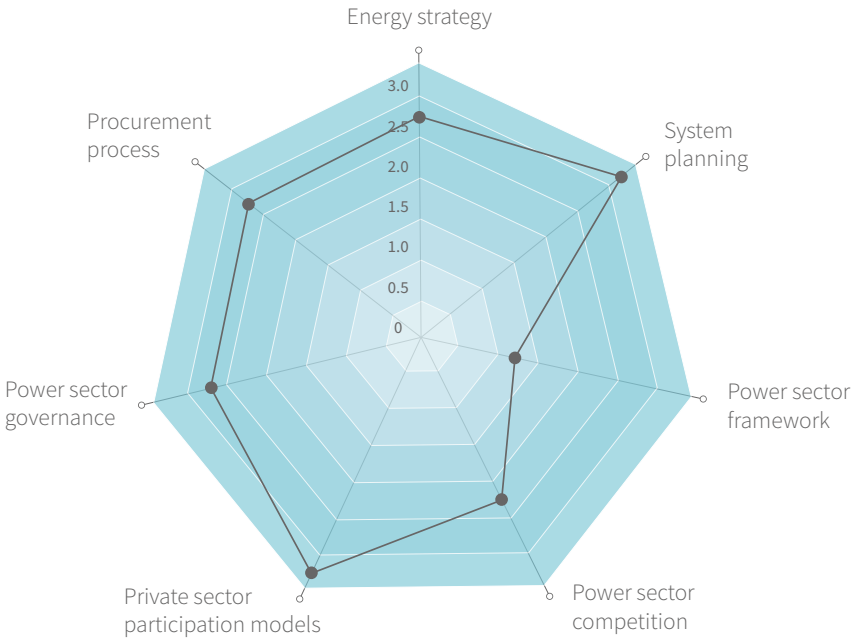


The review of policies, laws, and regulations for the off-grid segment confirms the ability of Zambia's authorities to reform regulations to create a conducive environment for off-grid players. Overall, Zambia demonstrates excellent regulatory performance in most of the Topics assessed, with several Topics reaching the maximum score across the *openness*, *attractiveness*,

and *readiness* Dimensions. Most of these results can be explained by the recent adoption by the ERB of dedicated regulation for mini-grids. The regulation has not yet been gazetted as it is being road-tested; however, it is annexed as a condition to accessing licenses. However, Zambia continues to show room for regulatory improvements in key areas such as *power sector framework*, *credit enhancement*, and *system quality and security standards*.

A deep dive into the Openness dimension

Figure 26: A deep dive into the Openness dimension for off-grid



Most of the Topics covered by the *openness* Dimension related to the off -grid segment achieve a high score, with the exception of *power sector framework* and *power sector competition* whose scores are relatively low. The section below focuses on the main findings of the review of Topics relevant for the *openness* Dimension. Only the elements relevant for the off-grid segment are highlighted in the section. For a more extended review of all the Topics, refer to *Generation–Openness, Transmission–Openness*, and *Distribution–Openness.*

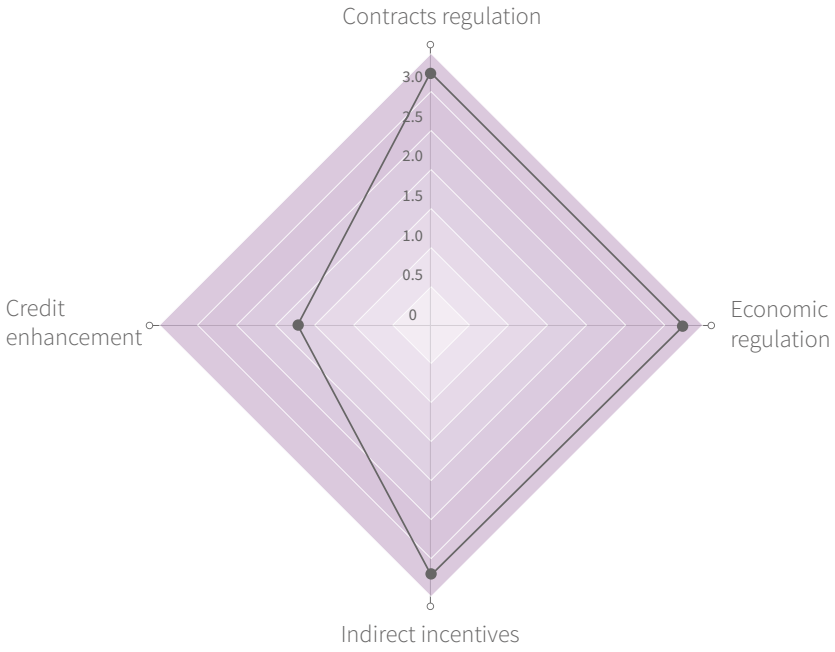
Energy strategy

The policy and strategy to provide off-grid sector policy guidance are well articulated in Zambia. National priorities for electrification expansion are part of the National Energy Policy, 2019. The policy is completed by the Rural Electrification Master Plan (REMP) 2008-2030 which details targets related to electrification expansion, technology development, and others. Such targets, however, are not backed by legislative instruments that can enforce their achievement.

 System planning	The outstanding performance in the *system planning* Topic is based on the availability of the REMP 2008-2030 as a national blueprint for electrification efforts. As defined in the Rural Electrification Act 2011, REA has the mandate to "develop, implement, and update rural electrification master plans for the systematic electrification of rural areas." The current REMP presents electrification targets and technology-specific investment paths to follow. It also presents a chapter dedicated to Electrification Priority of Project Package, which serves as an indicative investment plan up to 2030.
 Private sector participation model	Zambia successfully adopted reform to open the off-grid segment, both for stand-alone systems and mini-grids, to private companies, demonstrating high regulatory performance in this area. Private sector participation in the off-grid segment is possible through the EPC model (construction of asset procured by REA), merchant investments, and potentially concessions.
 Power sector governance	A new regulatory framework for mini-grids, approved in 2018 by ERB, introduces a new dedicated license for off-grid operators combining generation, distribution, and supply of electricity. Requirements and procedures have been differentiated on the use of the produced energy (selling, own, use) and capacity thresholds (less than 100 kW, between 100 kW and 1 MW, greater than 1 MW, and solar home systems). The off-grid market governance benefits from the presence of the Rural Electrification Authority, established by the Rural Electrification Act, 2003. These factors combined demonstrate the high regulatory performance of Zambia related to off-grid *power sector governance*.
 Procurement process	Public-Private partnership models are available for off-grid systems (according to the Ministry of Energy). Furthermore, competitive tendering is used by REA to procure the construction of rural electrification projects.

A deep dive into the Attractiveness dimension

Figure 27: A deep dive into the Attractiveness dimension for off-grid



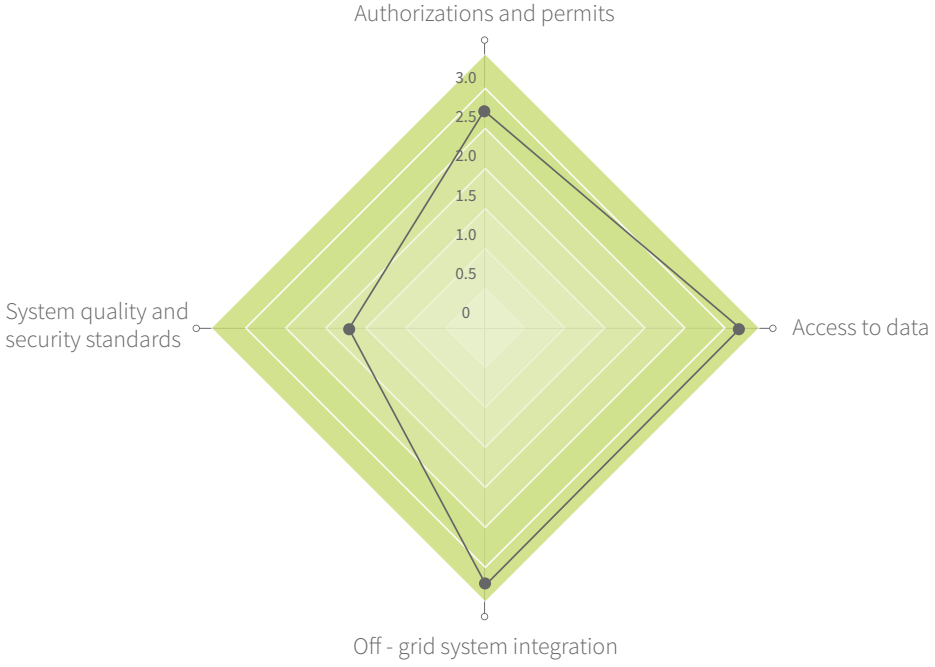
Three of the four Topics covered under the *attractiveness* Dimension in the off-grid segment receive the maximum score with the exception of *credit enhancement* whose score is relatively low. The section below focuses on the main findings of the review of Topics relevant for the *attractiveness* Dimension. Only the elements relevant for the off-grid segment are highlighted in the section. For a more extended review of all the Topics, refer to *Generation–Attractiveness, Transmission–Attractiveness*, and *Distribution–Attractiveness.*

Contracts regulations	The electricity market regulatory environment of Zambia demonstrates high performance related to contracts regulation in the off-grid market. ERB's mini-grid regulation requires that pro-forma customer contracts need to be submitted by license applicants in their applications and receive regulatory approval from ERB, providing a form of standardization of supply contracts. Rules on metering are set in the license and reiterated in the technical requirements.
Economic regulations	Similarly, the regulatory environment demonstrates high performance related to *economic* regulation in the off-grid market. ERB approved regulation on mini-grids details the rules on tariffs applicable to mini-grids in Zambia. Rules are differentiated per category of mini-grids (based on capacity thresholds). The result is a system with an increasing level of regulation for tariffs: some deregulated, some with a detailed formula for calculation of tariffs. All tariffs will need to be approved by ERB. Capacities over 1 MW must apply for tariffs approved by ERB based on allowed costs that have been determined through a periodic review process.

Indirect incentives	Zambia extends indirect incentives to off-grid private investors. For example, batteries and inverters for solar technology are duty-free and VAT exempt. Solar panels also receive VAT relief, enhancing project viability in the off-grid market.
Credit enhancement	Credit enhancement instruments such as multilateral guarantees, CAPEX subsidies, and concessional financing are made available from national and international institutions. The lack of government guarantees and the limiting of concessional lending to government-owned companies are *credit enhancement* areas for further consideration and improvement.

A deep dive into the Readiness dimension

Figure 28: A deep dive into the Readiness dimension for off-grid



Zambia achieves high performances in almost all the Topics considered by the *readiness* Dimension related to the off-grid segment, with the exception of *system quality and security standards* whose score is relatively low. The section below focuses on the main findings of the review of Topics relevant for the *readiness* Dimension. Only the elements relevant for the off-grid segment are highlighted in the section. For a more extended review of all the Topics, refer to *Generation–Readiness, Transmission–Readiness*, and *Distribution–Readiness.*

 Mini-grid integration	ERB's Technical Requirement for Mini-Grids 2018 details rules on the commercial options and exit strategy available to mini-grid operators in the case of the arrival of the main grid. The rules provide maximum flexibility and foresee several possibilities for operators, thus explaining the maximum regulatory performance achieved in this Topic. Operators can sell the eligible assets and/or the client base to the main grid operator, become a small power distributor (SPD) or a small power producer (SPP) for the main grid, or conclude a net-metering agreement with the main grid operator.
 System quality and security standards	Technical requirements, quality of service, and quality assurance of products for mini-grids are all aspects considered by the ERB's Technical Requirements for Mini-Grids. Technical requirements in terms of main grid compatibility are differentiated by clusters, with mandatory main grid readiness for all categories after ERB notice. Rules for cost contribution for main grid readiness are also provided. Quality of supply, customer service, and metering rules are all defined by cluster. These are major regulatory certainties relevant to off-grid private investors. Further improvement related to national standards for the quality of products in off-grid applications could enhance regulatory performance in this area.
 Access to data	Availability of data relevant for off-grid operators is ensured by ERB's annual reports, detailing fundamental market data, and the Zambia Statistic Agency providing fundamental data on the national socio-economic environment.

Conclusions and Recommendations

Environmentally friendly and sustainable wind turbines used to generate electricity on a wind farm
Photo credit: RovingPhotogZA

4. Conclusions and Recommendations

Since 1991, which marked the beginning of a liberalization phase for Zambia's economy, and the adoption of a new national energy policy (NEP) in 1994, Zambia has made significant progress in reforming its electricity supply industry. The energy policy, 1994, marked a strategic shift in the power sector. Private sector participation in the development of electricity infrastructure was encouraged, privatization of segments of the value chain were planned, and, more generally, the sector was meant to go towards restructuring and liberalization. New legislation was enacted to achieve these goals.

The adoption of the Electricity Act, 1995, ended the statutory monopoly of the public utility, ZESCO, and allowed private participation in the electricity supply industry. The same year, the adoption of the Energy Regulation Act, 1995, established the ERB as an independent regulator and the sole licensing authority of the sector. During this period, the first private actors, the Copperbelt Electric Company and Lunsemfwa Hydro Power, began operating in the country. However, private participation and investments remained, overall, limited due to a general lack of *attractiveness* of the national electricity market.

The second period of reforms started after 2010, and was pursued by the government after a decade of electricity crisis. The lack of investments caused frequent load-shedding and a general deterioration in the quality of the electricity service, while the demand was growing driven by economic expansion. This crisis pushed the government to undertake new actions and reforms to support the development of electricity infrastructure, starting from the update of the National Energy Policy, in 2008. New impetus was given to attracting private investments in the generation space, and several investors entered the market through the IPP model. In addition, the REFiT Strategy, approved in 2017, kick-started the development of the national renewable energy sector. In the meantime, Zambia was able to expand the access to electricity, going from about 20 percent before 2010 to above 40 percent in 2019, thanks also to the adoption of the Rural Electrification Master Plan in 2008.

The improvements made in the policy and regulatory regime brought important results, starting from the removal of ZESCO monopoly, the successful introduction of IPPs, the diversification of the energy mix, and the development of the national solar sector. However, Zambia continued to be highly dependent on hydropower, exposing the country to the risk of droughts and their consequences on the availability of electricity. Since 2016, Zambia entered a new period of recurrent electricity crisis with frequent load-shedding. In 2019, the country experienced its worst electricity crisis, bringing electricity sector reforms in front of the political agenda.

The review of the National Energy Policy in 2019 marked the beginning of the third wave of sector reforms. The new national policy acknowledged the need to reform the sector governance and the subsequent regulatory frameworks. The diversification of the energy mix through the development of non-hydro renewables, the expansion of electrification efforts, including by developing off-grid technologies, and the need to achieve financial sustainability of the sector through tariffs review were all reaffirmed as the most pressing priorities for reforming the electricity sector. The NEP, 2019, emphasizes the role of legislative and regulatory reforms to solve some of the challenges of the national electricity system. The policy document highlights some of the areas where improvements are found to be necessary: tariff policy and rules;

sector governance and the powers of the regulator; public procurement rules and procedures; grid access regulation; and off-grid systems dedicated regulatory framework. All these Topics are considered by the methodology adopted in this regulatory review report.

A thriving electricity sector development involves government, industry, and society (or community) as the key players. The private sector has finance and technology to accelerate the pace of the national energy agenda. Zambia could benefit from the involvement of the private sector to meet energy sector development requirements and the achievement of Sustainable Development Goal 7. In this respect, defining and implementing regulatory improvement to enhance the *attractiveness* of the electricity market is essential to stimulate and crowd-in private investments.

Any sectoral value chain functions as a system made up of nodes. Its efficacy is as good as its weakest node/link. Indeed, the policy and regulatory framework play a fundamental role in ensuring a safe, reliable, and competitive electricity supply industry, and its weaker points, if not addressed; risk affecting the performance of the whole industry. The policy and regulatory review performed under this study confirms the good performances of Zambia in many areas of policies and regulations relevant for private sector participation, acknowledging also the recent efforts made in terms of strategy and governance reforms. During 2019, the main legislation of the sector was revised – both the Electricity Act and the Energy Regulation Act – and fundamental regulation for the development of the off-grid sector was adopted. The review considered positively such improvements. The assessment, however, also shows some areas that still require attention from the national electricity sector decision-makers.

4.1 Takeaways from the regulatory review

Related to the *Openness* of the electricity market

- The current legislation of the electricity sector ensures an adequate degree of *openness* of the generation segment for private investors. The good regulatory performance in the review of fundamental aspects as for the *system planning*, the *power sector governance*, *private sector participation models*, and *procurement process* confirm Zambia's ability to adapt and implement strong legislation for the sector. Such legislation and regulation provide a clear licensing framework, open to multiple options for private investors to enter the market, and ensure a more coordinated and effective public procurement of infrastructure projects, by also leveraging PPP opportunities. However, the country still lacks dedicated instruments to oversee and monitor the enforcement of policy decisions. Furthermore, Zambia's electricity market model remains organized around the vertically integrated public utility, potentially discouraging more active participation from private companies and restricting competition in the market. Generators are able to benefit from several commercial models to sell their electricity output; however,the development of decentralized routes-to-market (as private PPAs and self-consumption) are restrained by unclear wheeling conditions.

- Private companies benefit from a satisfactory degree of *openness* of Zambia's electricity transmission segment. Most notably, the legislation in force allows private sector participation in the transmission segment and private entities can own transmission assets and access licenses to operate as transmission service providers. Zambia,

therefore, demonstrates high regulatory performance related to *power sector governance* and *private sector participation models*. Several models are made available for private entities to invest in transmission infrastructures, with concession being the preferred one so far. Expansion needs for the transmission network are defined by the national integrated master plan. However, *system planning* regulation can be improved to ensure a regular update of national plans, a fair and transparent regulatory overview of planning excersises and the involvement of all interested stakeholders. The NEP does not set targets influencing network development as generation capacity expansion, electricity access expansion, or new grid-connected customers. Recent ambiguity introduced through the process for declaration of network infrastructures as common carriers may become a hurdle in attracting more private investments in transmission assets.

- The legislation in force relevant for the distribution segment ensures an adequate degree of *openness*, similar to the other segments. Private sector participation is allowed and distribution licenses are accessible for private entities. Both the CEC and NWEC own distribution networks and operate as distribution service providers over exclusive regional areas. Thus, confirming the good performances in the *power sector governance* and *private sector participation models* Topics. System planning rules for the distribution network are set by the ZDGC; however, the regulation remains poorly implemented and *system planning* requires attention, especially in ensuring a regular update of expansion plans. Although public tenders may be used to procure new distribution infrastructure, there has been no evidence of this occurring in the past.

- The off-grid segment benefits from a high degree of *openness* thanks, mostly, to the recent regulatory reforms dedicated to this market. The recently approved regulation for mini-grids, which remains under road-testing, enforced a dedicated licensing regime for off-grid operators, with simplified requirements and procedures for smaller systems. The regulation confirms Zambia's willingness to attract private investors in this segment, which also benefit from several models to enter the market. These elements added to the presence of REA, also responsible for electrification planning, and the availability of a blueprint for electrification expansion, the REMP. These advancements resulted in high regulatory performance related to *system planning*, *power sector governance*, and *private sector participation models*. However, there are remaing gaps related to the *power sector framework* and *power sector competition*.

Related to the *Attractiveness* of the electricity market:

- The review of the relevant policy and regulatory Topics considered in the *attractiveness* Dimension confirms their ability in ensuring a fair and attractive business environment to private investors in the generation segment. ERB regulatory oversight over PPAs/PSAs and its publicly available guidelines for their review ensures a high degree of standardization in wholesale contracts and explains the outstanding performances in the related Topic. Overseen by the ERB, tariff regulation is well developed, and specific guidelines for retail tariff determination are publicly available. However, tariffs remain below the costs of the service and the multi-year tariff review framework remains poorly implemented. The REFiT Strategy defines the policy framework for renewable energy development and considers dedicated supporting mechanisms such as feed-in-tariffs

and RE-specific auctions. However, there are gaps in dedicated legislation for renewable energy development, and giving legal back-up to the dedicated supporting schemes beyond capacity targets established by the REFiT. Electricity generators benefit from Tax reliefs and VAT reductions for electricity plant components, as well as from the availability of several credit enhancement instruments. Other indirect incentives, like carbon taxes and/or direct subsidies, are currently not implemented and may be beneficial to ensure adequate development of new generation capacities.

- Zambia's regulatory framework relevant for the transmission sector ensures a moderate level of *attractiveness* to crowding-in private investment. While transmission licenses are made available to private entities, which have to comply with the procedures and rules set by ERB, the available regulation does not state the standard provisions that need to be included in these licenses. The network tariff and wheeling charges are regulated by a dedicated sub-code in the Grid Code, and require regulatory approval from the ERB. However, implementation is still challenging. Credit enhancement instruments are potentially available for private investors in transmission assets, but so far concessional lending and multilateral guarantees have been limited to the public utility. Public guarantees are, however, unavailable, explaining the moderate performance in this area. Private participation in future transmission asset expansion may benefit from dedicated *credit enhancement* instruments.

- Similarly, the review of relevant regulations for the distribution segment confirms a moderate level of *attractiveness* to crowd-in private investment. While standardized distribution licenses shall be available to private entities, no information about their main provisions is publicly accessible. The ZDGC establishes the principles and objectives of the distribution tariff and gives ERB the mandate to regulate the price setting and the tariff structure for all distribution-related services. However, there are still gaps related to the application of such framework, and in the periodical tariff revision system. Credit enhancement instruments are available for distribution investors; however, government support through dedicated public guarantees is not available. Also in the distribution segment, private participation in future asset expansion may benefit from dedicated *credit enhancement* instruments.

- The review of regulations relevant for the off-grid segment confirms the success of the recent reforms in ensuring a high level of *attractiveness* of this market segment for private investors. ERB-approved regulation on mini-grids details the rules on tariffs applicable to all categories of mini-grids, leading to high regulatory performance in this area. Batteries and inverters for solar power are duty-free and VAT exempt, while panels also receive VAT relief, justifying the high performance in *indirect incentives*. Credit enhancement instruments such as multilateral guarantees, CAPEX subsidies, and concessional financing, are made available from REA and international institutions. Further attention to facilitate private companies access to such instruments would increase the overall *attractiveness* of Zambia's off-grid segment and consolidate private sector contribution to the development of these technologies and market.

Related to the *Readiness* of the electricity market

- The review of Topics considered by the *readiness* Dimension for the generation segment resulted in a very good regulatory performance for Zambia in this Dimension. Rules for accessing land, water rights, construction, and environmental permits are clear and easiliy accessible and dedicated issuing institutions are defined for all necessary authorizations. Only, the lack of a one-stop-shop has to be acknowledged and its establishement may result in easier accessibility and reduced administrative costs for investors. *System planning* benefits from the availability of the PSDMP, which details network infrastructure development scenarios. The ZGC, 2013, establishes the rules for the governance, operation, and connection to the interconnected transmission system and service. However, the lack of clear dispatching rules, priority dispatch to renewables, and dedicated curtailment management rules remain regulatory gaps to address related to the *grid code*. Open access right to the network is affirmed in the current legislation and in the network regulation, which provides also rules for connection charges. However, grid connection agreements are still negotiated bilaterally with the network operator and the lack of a standard framework introduces potential ambiguity and a lack of transparency in the correct implementation of the open access regime. *Access to data* is fairly ensured by the ERB for market fundamentals, the national statistic agencies and competent ministries for socio-economic ones and ZESCO itself. However, available financial information data on the public utility, fundamental to ensure transparency about the financial conditions of the single-buyer, is outdated and the regular publication of integrated annual reports remains to be ensured.

- Good performances is also observed in the *readiness* Dimension related to the transmission segment. Thanks to the clarity on rules for accessing land, right of way, and other relevant permits for transmission network investments, good performances are achieved in the *authorizations and permits* Topic which would, however, benefit from the establishement of a one-stop-shop. The extended coverage of the ZGC and ERB's regulatory oversight of transmission service operators are behind the high performance under the *grid code* Topic. *System quality and security standards* are also extensively defined by the national grid code. Despite the fact that legislation defines a mandatory open access regime to national electricity networks to be ensured by network operators, however, the lack of a standard framework for connection agreements explains the moderate performance in the *grid access* Topic. ERB regularly publishes market fundamental data, but detailed information on transmission service quality would help increasing transparency.

- The very good performances of most of the assessed Topics in the *readiness* Dimension are explained by the presence of the ZDGC. The ZDGC establishes the basic rules, procedures, requirements, and standards that must govern the operation, maintenance, and development of the electricity distribution systems in Zambia. It details rules to promote sound planning, operational standards of the distribution systems, including quality of supply and security standards, sets minimum requirements for tariff, metering and energy trading metering installations. It furthermore defines open access regime for all network users (loads and demand points), set connection agreement requirements and procedures as well as rules defining the allocation of connection charges. Thus,

explaining the maximum score in the *grid code* Topic. Crucially, it lays out an open-access regime for all network users, following provisions from the Electricity Act, 2019, and defines connection agreement requirements and general principles for connection charges. However, the lack of a standard contractual framework for connection agreement stands as a barrier to the effective implementation of open access. The ZDGC does not define a detailed methodology for wheeling and approval of connection tariffs, directly set by the ERB but currently not accessible. As for transmission service quality data, neither distribution service quality data are publicly available and their publication would help increasing transparency.

- The adoption of ERB's Technical Requirement for Mini-Grids, 2018, as part of the mini-grids regulation package, ensures very good performances in key Topics of the *readiness* Dimension for the off-grid segment. Several commercial options and exit strategies for mini-grid operators in the case of grid encroachment are foreseen by the existing regulation which answers perfectly to private investors' expectations in terms of *off-grid system integration* regulation. Technical requirements, quality of service, and quality assurance of products for mini-grids are all aspects also considered by the same regulation. But the lack of defined national standards for off-grid products still require attention. Quality of supply standards for mini-grids are defined by the ERB, and technical standards for mini-grids are differentiated by mini-grid clusters. However, as of now, there are no national certifications for off-grid products available and service standards are not uniform.

While acknowledging the efforts put in place by national institutions to strengthen Zambia's electricity sector policy and regulatory framework, the analysis demonstrated that some further regulatory action and reforms (or improvements) are needed to ensure enhanced *openness*, *attractiveness,* and *readiness* of the national electricity market through policies and regulations to effectively crowd-in private investors.

Recommendations on how to address the regulatory challenges highlighted by the assessment are provided to the relevant energy institutions. If implemented, these reforms would constitute positive steps towards strengthening the role of the private sector in supporting Zambia's electricity industry development and in providing reliable, competitive, and sustainable power for all.

4.2 Recommendations

To enhance the *Openness* of the electricity market:

Energy strategy

Strategic priorities for the energy sector are set by the National Energy Policy 2019, and influenced by the National Climate Change Policy 2016. Both policies are recent and Zambia's authorities demonstrated their ability to review and update policies recurrently. Both policies detail the government's plans for reforms, and the NEP benefits from the presence of a detailed implementation plan. To benefit from these policy guidances the country may:

- Set ambitious, yet realistic, quantitative targets (that is in terms of generation technology development, electricity access expansion, grid extension, served customers, GHG mitigation) along with instituting systems to support and overview their implementation.
- Implement formal, extensive, and stringent monitoring related to the roadmap of reforms, which would help track progress and in turn increase accountability.
- Consider legal backing, or legislation, to the policy formulation and review process to strengthen the enforceability of targets.

System planning

Despite the presence of an integrated power system development master plan, covering the period 2010-2030, there are gaps related to effective system planning. Both the ZGC and ZDGC define responsibilities and principles for network system planning which are poorly implemented. The country lacks of dedicated regulatory oversight of the planning process. Therefore, Zambia may:

- Implement dedicated regulation for system planning, defining responsible authorities for the regulatory oversight of system planning process. This should include a consultative practice involving market players and relevant institutions, and a formal procedure accompanied by timelines.
- Incorporate in the integrated planning off-grid solutions as part of the infrastructure solutions for the development of the electricity supply industry and the expansion of access to energy.
- Develop and communicate investment plans, outlining medium and long-term project pipelines to send market signals to private investors.

Power sector governance

The Electricity Regulation Act 2019, enhanced ERB's regulatory oversight on the national electricity sector. The ERB today is responsible for issuing licenses, for the economic and technical regulation of the sector, for approving PPAs and PSAs, among others. To fully comply with its mandate, the ERB would benefit from strong and stable budgetary resources, able also to guarantee the financial and political autonomy of the institution.

Power sector framework

The restructuring of ZESCO and the unbundling of the public utility, through the separation of its commercial activities from the regulated ones, could unlock a variety of positive effects on the Zambian electricity market and encourage private sector participation. Therefore, Zambia's government shall:

- Assess the feasibility of creating an independent transmission operator by separating the system operation and transmission service provider functions of ZESCO from its electricity generation functions.
- Move further with exploring the feasibility of unbundling the generation and distribution functions of ZESCO to create more space for private sector participation in these two market segments, as well as in electricity trade and retail.

Power sector competition

Consumers, both at the wholesale and retail level, may benefit from the possibility to procure their electricity from a preferred supplier, beyond ZESCO, CEC, and NWEC that effectively do not compete due to exclusive areas of operation:

- Market restructuring towards more competition within the market, and not only for the market, is compulsory to carry with its benefits of costs and price reductions.

Procurement process

Along with clear rules and procedures for the public procurement of electricity infrastructures, Zambia would benefit from:

- The definition of public schedules detailing the foreseen projects pipeline. These plans, when publicly available and well-publicized, provide the necessary visibility to investors and ensure a higher degree of competitivity among the bidders, with consequent benefits in terms of costs reduction.

Generation off-taking options

The development of decentralized routes-to-market for private generators, as private PPAs and self-consumption arrangements, are essential to foster private sector participation. To pave the way to their development the adoption of a clear regulation to implement the open access regime and ensure fair and transparent wheeling conditions is mandatory.

To enhance the *Attractiveness* of the electricity market:

Contracts regulation

The rights and obligations of transmission and distribution service providers are defined by the dedicated licenses, serving as standard transmission and distribution service agreements in Zambia's market context. However, relevant information about what are the main provisions considered by these licenses is not available. Therefore, Zambia would benefit from clarifying licensing regime for these services, particularly by:

- Ensuring that licenses benefit the operators through a fair remuneration for the services provided and collection of fees from their customers, according to agreed tariffs.
- Providing regulatory clarification on the process for declaring network assets as common carriers and ensure fair remuneration for network operators to avoid jeopardizing private initiatives in network infrastructure expansion.
- Instituting guidelines on the use of system, or wheeling agreements, to provide clarity to network customers and ensure equal access conditions to the network infrastructure.

Economic regulations

ERB oversees the economic regulation of the power sector with the power to review tariffs at the wholesale level (defined by PPAs and PSAs), define and approve network tariffs following the principles set by grid codes, and set and review retail tariffs. However, the lack of a cost-of-service study is still a barrier to define cost-reflective tariffs and the implementation of the multi-year price review framework remains challenging. In this regard, Zambia should continue to sustain the move towards cost-reflectiveness of electricity tariffs by:

- Conducting an extended cost-of-service study to disclose the real cost structure of Zambia's electricity supply industry.
- Unbundling electricity tariffs by defining differentiated price points related to electricity services – generation, transmission, and distribution – to stimulate competition and target incentives.
- Ensuring a fair implementation of the multi-year price review mechanisms to ensure cost-reflectiveness and enhance the long-term financial equilibrium of the sector.

Incentives

To complete the current incentive scheme and provide stronger and long-term signals to interested investors, notably in the renewable space, Zambia should assess the need for a dedicated legislation for the renewable sector, going beyond the current REFit Strategy. Providing legislative back-up to renewable supporting mechanisms would underline Zambia's commitment to shift towards a sustainable electricity system and facilitate private sector involvement.

Indirect incentives

The availability of indirect incentives plays a key role in strengthening the business cases of private electricity infrastructure investments. While Zambia already offers tax reliefs and fiscal exemptions, evaluate the opportunity of indirect incentives such as subsidies, results-based financing, and carbon price solutions would offer new opportunities to strengthen the business case of investments in electricity infrastructure.

Credit enhancement

Credit enhancement mechanisms play a fundamental role in derisking electricity infrastructure projects and increase bankability. If investors in the generation segment have benefitted from such instruments, these are much less available for investors in network infrastructure. Assess the effectiveness of extending public guarantees and concessional financing to network investors to improve the bankability of such investments.

To enhance the *Readiness* of the electricity market:

Authorization and permits

The division of competencies for processing and issuing authorizations and permits imposes transaction costs. Therefore, the institution of a one-stop-shop, or a single-window, for application and issuing of all authorizations and/or permits to serve as a single point of contact for all interested investors will reduce administrative burden and costs for private investors.

Grid code

Dispatch rules are fundamental to ensure the safety, stability, and affordability of electricity supply; this is why they are a fundamental aspect of grid code regulation. The typical objective for the dispatching process is minimizing electricity delivery cost to meet the expected system demand while complying with security requirements. Zambia's dispatch rules are defined by the ZGC in its operation sub-code which states that the system operator shall dispatch generation subject to constraints of security, reliability, and the environment, without mention of the economic dimension. Therefore:

- Zambia should review its network operation sub-code, notably in the definition of its dispatching rules and procedures, especially in the light of increased diversification of its electricity mix and the entry of multiple generators in the system.

Grid access

Ensuring fair and open access to network infrastructure is a key aspect of market *readiness*. Open access regime needs to be clearly defined in the foundational legislation of the sector and then reflected in all the related technical regulations. These regulations need to define standard contractual frameworks for grid connection, clear wheeling tariffs, as well as rules for allocation of connection costs. The current lack of standard connection agreements in Zambia leaves room for ambiguity, as access conditions are bi-laterally negotiated with the transmission asset owner. Therefore:

- Review and address grid access regulation in terms of wheeling charges, and adopt a standard framework for connection agreements to increase transparency and enhance market *readiness* to private sector participation.

System quality and security standards

The off-grid segment could significantly benefit from the definition of national standards and a certification system for off-grid products and components. Therefore, pursue the establishment of national standards for off-grid systems.

Access to data

Access to data is a crucial aspect when making informed decisions by market participants. Therefore, increase market transparency by regularly publishing and update relevant market information and data.

4.3 Way forward

The review of Zambia's policies, laws, and regulations relevant to the electricity supply industry confirms the good results achieved by national authorities in reforming the regulatory environment towards greater private sector participation. The review and amendment of the foundational legislation of the sector strengthened the governance of the electricity supply industry. It also provided better clarity to market operators and potential investors. Major progress is made in the governance and regulation of the off-grid market to address the electricity access challenge in rural areas and support the scale-up of off-grid investments.

Zambia is, however, still confronted with structural challenges related to the financial stability of ZESCO, its overdependence on hydropower which exposes the country to the continuous risk of load shedding, and consequently, the need to diversify the electricity mix. The slow progress in increasing electricity access in rural areas represented a major challenge that compelled the government to take urgent actions to develop the off-grid market. The adoption of the National Energy Policy 2019 acknowledged the need to continue reforming sector governance and the legislative and regulatory framework to stimulate private investments and support infrastructure development to achieve electricity access for all.

As Zambia initiated its third wave of sectoral reforms, policies and regulations would play a pivotal role in enabling effective private sector contribution to the expansion and development of the national energy supply industry. Towards this end, this report evaluated the *openness*, *attractiveness*, and *readiness* of the current national policy and regulatory framework across the value chain. Areas of strength, as well as areas of further improvement, have been identified, and key recommendations are offered to support Zambia in achieving its goals. Towards this end, this regulatory review offers constructive identification of areas of reform and policy and regulatory enhancement for a competitive, resilient, and sustainable electricity sector. Zambia's economic recovery and long-term sustainable growth will need a reliable electricity supply to thrive.

The UN Economic Commission for Africa and the RES4Africa Foundation remain committed to supporting Zambia in addressing any of the identified regulatory and policy gaps, investing in the necessary regulatory capacity development, as well as any area of particular reform interest of Zambia towards greater *openness*, *attractiveness*, and *readiness* of the market. They also call on the development community, NGOs, ISOs, national organizations, and the private sector to play their constructive role in supporting the efforts of the Government of Zambia in this reform process, guided by its public institutions, aimed at economic transformation and achievement of SDG7 goals.

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Acronyms

AfDB	African Development Bank
BBC	British Broadcasting Corporation
BOO	Build, Operate, and Own
BOOT	Build, Own, Operate, and Transfer
BOT	Build, Operate, and Transfer
BOZ	Bank of Zambia
CAPEX	Capital Expenditure
CEC	Copperbelt Energy Company
DAM	Day-Ahead Market
EISS	Energy, Infrastructure, and Services Section
ERB	Energy Regulation Board
ERP	Economic Recovery Plan
ESAP	Electricity Service Access Project
ESI	Energy Supply Industry
FPM	Forward Physical Market
GDP	Gross-Domestic Product
GET FiT	Global Energy Transfer Feed-in Tariff
GHG	Greenhouse Gas
GRZ	Government of the Republic of Zambia
GWh	Giga-Watt per Hour
ICA	Impact Capital Africa
IDM	Intra-Day Market
IEA	International Energy Agency
IMF	International Monetary Fund
IPPs	Independent Power Producers
IPT	Isoniazid Preventive Therapy
KCM	Konkola Copper Mines
KPIs	Key Performance Indicators
MFEZ	Multi-Facility Economic Zones
MoE	Ministry of Energy
MOF	Ministry of Finance
MW	Mega-Watt
NCP	National Climate Policy
NDP	National Development Plan
NEP	National Energy Policy
NES	National Electrification Strategy
NWEC	North Western Energy Company
OPPPI	Office for Promoting Private Power Investment

PPAs	Power Purchase Agreements
PPP	Private-Public-Partnership
PSA	Pressure Swing Adsorption
PSDMP	Power System Development Master Plan
REA	Rural Electrification Agency
REF	Rural Electrification Fund
REFiT	Renewable Energy Feed-in Tariff
REMP	Rural Electrification Master Plan
RES	Renewable Energy Sources
RES4Africa	Renewable Energy Solutions for the Mediterranean and Africa
ROAR	Regulatory review of the Openness, Attractiveness, and Readiness
RGC	Rural Growth Centers
SAPP	Southern Africa Power Pool
SDGs	Sustainable Development Goals
SHS	Solar Home Systems
SPD	Small Power Distributor
SPP	Small Power Producer
UNECA	United Nations Economic Commission for Africa
USD	United States Dollar
VAT	Value-Added Tax
ZDA	Zambia Development Agency
ZDGC	Zambian Distribution Grid Code
ZEMA	Zambia Environmental Management Agency
ZESCO	Zambia Electricity Supply Corporation Limited
ZGC	Zambian Grid Code
ZPPA	Zambia Public Procurement Authority
ZRA	Zambezi River Authority

Annexes

Annex A
Policies, Plans, and Regulations

National Energy Policy (2019)	https://www.moe.gov.zm/?wpfb_dl=51
Renewable Energy Feed-In Tariff Strategy (2017)	https://www.moe.gov.zm/wp-content/uploads/2018/06/The-Renewable-Energy-Feed-in-Tariff-REFiT-Strategy-2017.pdf
National Policy on Climate Change (2016)	https://www.mlnr.gov.zm/?wpfb_dl=74
Power System Development Master Plan for Zambia (2011)	https://www.moe.gov.zm/?wpfb_dl=46
Rural Electrification Master Plan (2008)	http://www.rea.org.zm/about-us/remp.html
Ministry of Energy Strategic Plan 2018-2021	https://www.moe.gov.zm/?wpfb_dl=55
Energy Regulation Act No. 12/2019	https://www.moe.gov.zm/?wpfb_dl=69#:~:text=An%20Act%20to%20provide%20for,connected%20with%2C%20or%20incidental%20to%2C
Electricity Act No. 11/2019	https://www.parliament.gov.zm/sites/default/files/documents/acts/The%20Electricity%20Act%20No.%2011%20of%202019.pdf
Rural Electrification Act No. 20/2003	https://zambialii.org/zm/legislation/act/2003/20/rea2003220.pdf
Rural Electrification Amendment Bill, 2021	https://www.parliament.gov.zm/sites/default/files/documents/bills/The%20Rural%20Electrification%28Amendment%29%20Bill%2C%202021%20NAB%2020.pdf
Zambian Grid Code (2013)	https://rise.esmap.org/data/files/library/zambia/Zambia%20Supporting%20Documents_2017/CC/CC_9_ZambianGridCode.pdf
Zambian Distribution Grid Code (2016)	http://erb.org.zm/downloads/gridcode/ZambiaDistributionGridCode.pdf
Public-Private Partnership Act (2009)	https://ppp.worldbank.org/public-private-partnership/sites/ppp.worldbank.org/files/ppp_testdumb/documents/zambia_ppp_act_2009.pdf
Electricity Tariff Determination Guidelines for Retail Customers	http://www.erb.org.zm/downloads/eregulation/guidelines/electricityTariffDeterminationGuidelines.pdf

Annex B
An overview of the Topics assessed

Openness	Energy Strategy	The existence and characteristics of energy and climate policies.
	System Planning (also *readiness*)	The existence and characteristics of plans for generation expansion, network development and electrification.
	Power Sector Governance	The existence of an Energy Act or Law defining the operational regime of market agents, and the existence and role of an energy regulatory authority.
	Power Sector Framework	The degree of unbundling of generation, transmission, and distribution services.
	Power Sector Competition	The openness of the electricity market to competition.
	Private Sector Participation Model	The number of available models for private parties to participate in the power sector.
	Procurement Process	The characteristics of PPP procurement policy, competitive tenders, and solicited/ unsolicited proposals.
	Off-taking Options (for *Generation*)	The existence of a spot market or single-buyer as well as the regulatory characteristics of private PPAs and captive generation.
Attractiveness	Contract Regulation	The structure and characteristics of public PPAs, TSAs, DSAs, and standard retail contracts for off-grid operators.
	Economic Regulation	The structure and definition of the retail and network tariff.
	Incentives	The existence of instruments incentivizing private investors to operate in the power sector (e.g., FiT, capacity payments, green certificates, RES quotas).
	Indirect Incentives	The existence of policies or instruments indirectly incentivizing private investors to operate in the power sector (e.g., carbon pricing, result-based financing, tax relief).
	Credit Enhancement	The existence of lending agreements or guarantees that reduce risk or costs for private investors entering the power sector.

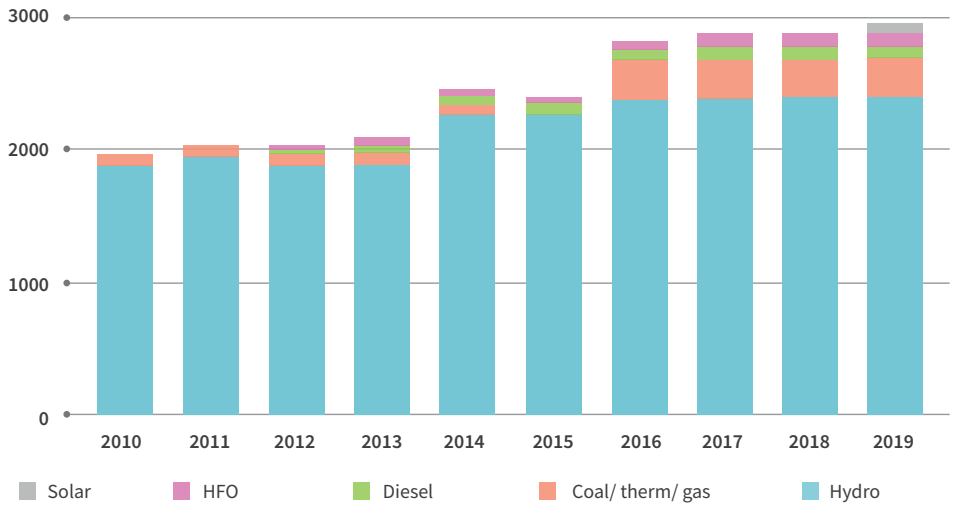
Readiness	Authorizations and Permits	The existence and characteristics of permits needed for the construction of assets in the power sector (e.g., land & water rights, construction, and environmental permits).
	System Planning	The existence and characteristics of the network development plan.
	Grid Code	The characteristics of the grid code (e.g., the existence of rules for system operation and connection).
	Grid Access	The existence of third-party access and the characteristics of grid connection and operation agreements.
	System Quality and Security Standards	The existence of quality and security standards for transmission network planning and operation.
	Access to Data	The public availability of data related to electricity sector performance.
	System Integration (for *Off-Grid*)	The existence and characteristics of regulation for grid arrival.

Annex C
Installed grid electricity generation capacity (as of December 2018)

Power Plant	Owner	Installed capacity (MW)
Hydro		**2398.5**
Kafue Gorge (KN)	ZESCO	990
Kariba North	ZESCO	720
Kariba North Extension	ZESCO	360
Victoria Falls	ZESCO	108
Lunzua River	ZESCO	14.8
Lusiwasi	ZESCO	12
Chishimba Falls	ZESCO	6
Musonda Falls	ZESCO	10
Shiwang'andu	ZESCO	1
Itezhi-Tezhi	Itezhi-Tezhi Power Corporation	120
Ikelengi/Zengamina	Zengamina Power	0.7
Mulungushi	Lunsemfwa Hydro Power	32
Lunsemfwa	Lunsemfwa Hydro Power	24
Thermal		**493.6**
Maamba Power Plant (coal)	Maamba Collieries	300
CEC Standby Plants (diesel)	Copperbelt Energy Corporation	80
Luangwa (diesel)	ZESCO	2.6
Shang'ombo (diesel)	ZESCO	1
Ndola (heavy fuel oil)	Ndola Energy	110
Renewables (solar)		**89.13**
Samfya	Rural Electrification Authority	0.06
Kitwe	CEC	1
Sinda Village	Muhanya Solar	0.03
Ngoye (LSMFZ)	Ngonye Power	34
Bangweulu (LSMFZ)	Bangweulu Power	54
Luangwa Bridge	Solera Power	0.01
Kafue	Standard Microgrid	0.02
Chirundu	Mugurameno	0.01
TOTAL		**2981.23**

Source: STATISTICAL BULLETIN 2018 - Energy Regulation Board
https://www.erb.org.zm/downloads/eregulation/statisticalbulletin/statBullet2018.pdf

Annex D
Evolution of on-grid installed capacity (MW, 2010-2019)



Source: ERB annual reports

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