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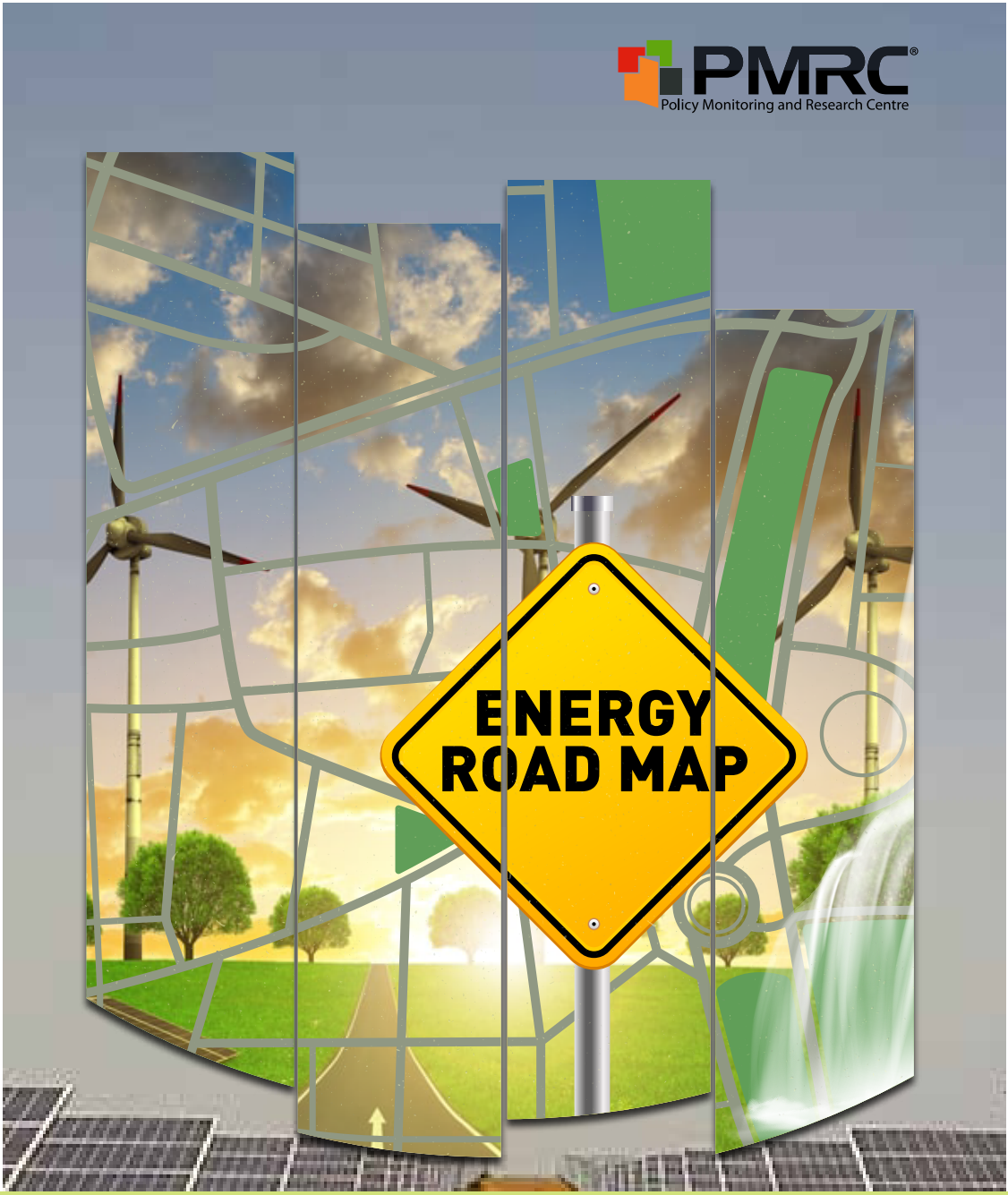

ENERGY ROADMAP - DELIVERING ZAMBIA'S ENERGY NEEDS

RESEARCH REPORT

December 2018

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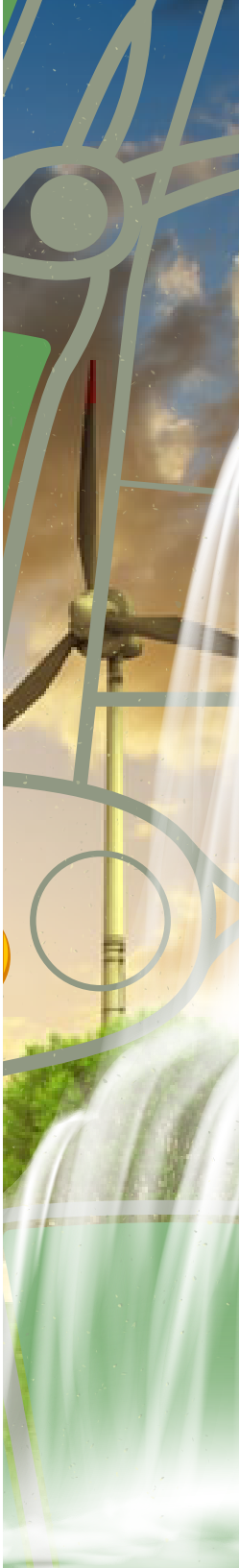
ENERGY ROADMAP - DELIVERING ZAMBIA'S ENERGY NEEDS



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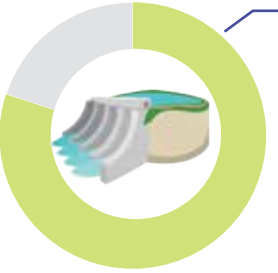
ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
IPP	Independent Power Producers
ZESCO	Zambia Electricity Supply Corporation
ERB	Energy Regulation Board

EXECUTIVE SUMMARY

An adequate power supply underpins any economy. However, Zambia has struggled to generate enough electricity to meet growing demand as the country has developed. This longstanding issue came to a head in 2015/16 when poor rains depleted the hydroelectric power stations which provide over **80%** of Zambia's power. The ensuing load-shedding had severe consequences for the economy, as businesses scaled back production, small to medium sized enterprises struggled and households experienced blackouts, with the total impact estimated to be equivalent to **20%** of annual GDP. As demand continues to grow, it is essential that Zambia gets energy generation right if the country is to fulfil its potential for growth.

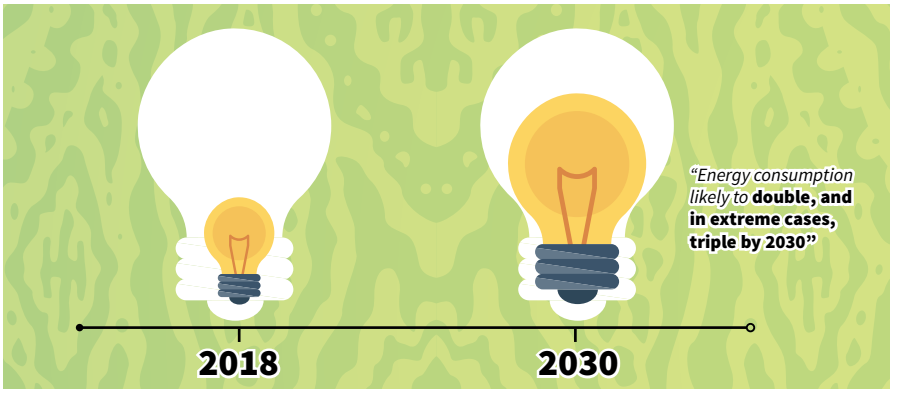


80%

HYDRO-POWER

"Hydroelectric power stations provide over 80% of Zambia's power"

While the country has appeared to overcome short-term challenges in electricity generation, there can be no room for complacency. The fundamental challenge of exponential increases in demand remains. This paper models energy consumption by households and economic sectors to project that demand is likely to double, and, in the most extreme case, triple by **2030** as population, income levels and electrification increase and the economy continues to grow. Furthermore, without diversification of power sources, electricity supply will remain vulnerable to seasonal rain pattens and long-term climate change. Moreover, the Government's fiscal position in the face of high debt levels limits the scope for direct investment in improved capacity. The Government faces an urgent challenge to develop a high-capacity, diversified energy portfolio to meet rising demand with limited resources.



The key to adequately improving power supply in line with fiscal consolidation is through private sector investment in **Independent Power Producers (IPPs)**. The country has struggled to attract this investment for numerous reasons, including below-cost tariffs, complex procurement processes and an underperforming regulator. Following PMRC's recommendations, the Government has made reforms to increase tariffs to make them more cost-reflective, which has improved the country's attractiveness to investors. However, these changes alone are not enough to stimulate the investment that the country needs but has struggled to secure.

This paper calls for Government action to secure investment to develop energy capacity to meet rising demand without compromising its fiscal consolidation programme. Firstly, the government must make Zambia a more attractive option for investors. Secondly, it must make institutional changes to its planning and procurement capacity to secure a productive, cost-effective and diversified investment portfolio.

PMRC therefore makes recommends that the Government:

- Establishes a planning function to develop a strategic vision for Zambia's energy portfolio and guide procurement;
- Establish a procurement function that sits alongside the planning function to implement the strategy and secure investment at better value for money, through improved commercial capacity, more competitive tenders and a streamlined procurement process;
- Make reforms to improve the credit-worthiness of ZESCO as off-taker to improve investor confidence through increased financial transparency and more secure guarantees; and
- Make governance reforms to the Energy Regulation Board (ERB) to improve its independence and its effectiveness so that it better serves both investors' and consumers' interests.

1. INTRODUCTION / SUMMARY

Zambia faces a challenge to meet rising demand for electricity as the economy, population and electrification continue to grow. Load-shedding in 2015-16 demonstrated just how high the stakes are for meeting this challenge as the economy suffered losses equivalent to **20%** of GDP ***(Samboko et al 2016)*** and government bore the cost of expensive energy imports. As government undergoes fiscal consolidation in response to high debt levels, it should look to increased investment in **Independent Power Producers (IPPs)** to develop energy capacity. This approach offers the opportunity to meet increased demand in a way that protects fiscal spending and ultimately promotes long-term economic growth.

IPPs offer a sustainable route to increased energy capacity across Sub-Saharan Africa, where public and utility financing has traditionally been the largest source of investment in power generation. This picture is true of Zambia, where IPPs currently make up a small but growing part of Zambia's energy portfolio through plants ranging in capacity from a few megawatts to around **300MW**. Zambia has faced significant challenges in attracting IPP investment for several reasons, including below-cost tariffs, its regulatory framework and procurement processes, all of which need to be addressed if Zambia is to better exploit the opportunities that IPPs provide.

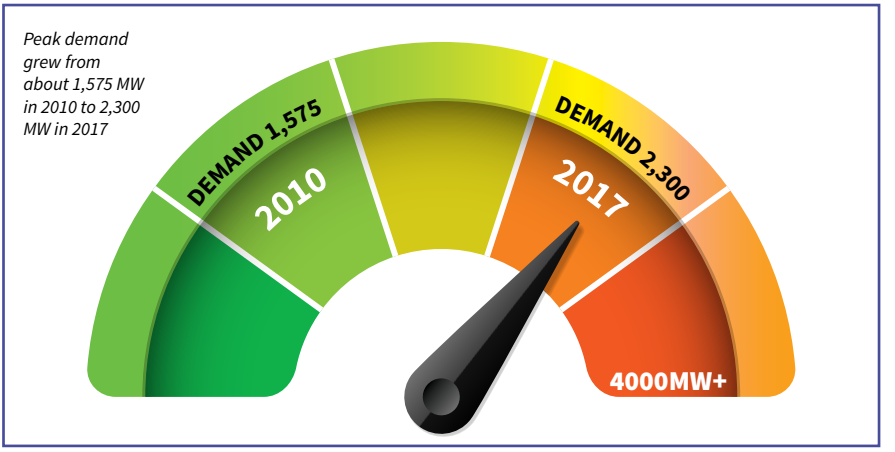
This report highlights the challenges that policymakers are facing in promoting effective investment. The report first summarizes the challenges facing Zambia's energy sector: it provides a new forecast for increased demand and identifies key problems of insufficient capacity and overreliance on hydropower. It then analyses the state of the energy sector and identifies the current role of IPPs. Finally, it looks to other countries in sub-Saharan Africa for lessons in accelerating investment in IPPs and concludes with recommendations for how government can develop a healthy market for investment and improve internal planning and procurement capacity in order to secure a productive, cost-effective and diversified portfolio of energy generation.

2. CHALLENGES FOR ZAMBIA'S POWER SECTOR

Over the last 25 years, Zambia's economy has been transformed. National income has more than tripled since 1990, living standards have risen and Zambia has been reclassified as a middle-income country. Economic growth is expected to keep rising. However, since 2008 electricity supply in Zambia has lagged behind the country's rapidly growing demand and threatens to undermine future growth. Due to poor rains in 2015-16, the country experienced severe load-shedding, which has been found to have caused economic losses of equivalent to **20% of GDP**. The underlying problems of dependency on hydropower and limited capacity remain and will continue to threaten economic growth: as the population, economy and electrification continue to grow, the country urgently needs to address a number of challenges, all within the context of fiscal constraint:

RISING DEMAND

Zambia's electricity demand has grown rapidly as the economy has expanded. Statistics from state utility company ZESCO indicate that electricity supplied increased at an average rate of **3%** per year over the period 2010 to 2017. Peak demand grew from about **1,575 MW in 2010** to **2,300 MW in 2017**. Growth is heavily driven by the high demand for electricity by Zambia's mining industry, which consumes more than 50% of power produced.



While economic growth has slowed somewhat in recent years, recent projections of electricity demand are for significant growth over the next 10-15 years:

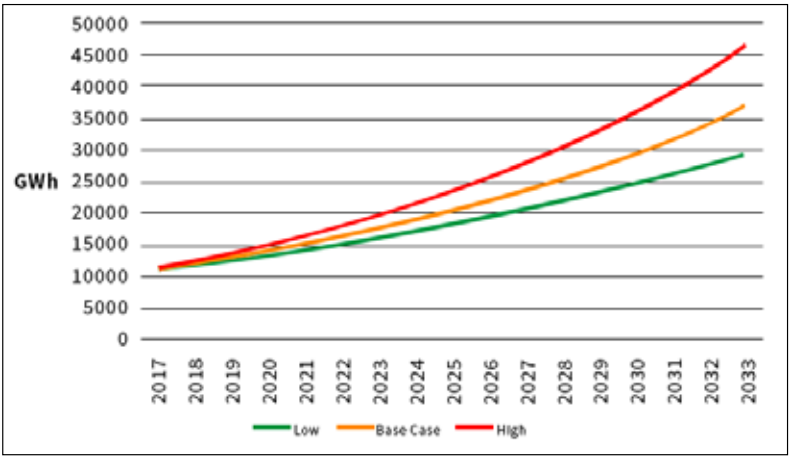
- In 2010, the Ministry of Energy (MoE) forecast that peak electricity demand would reach around **2,800 MW** *(see PMRC 2013)*. Tembo and Merven (2013), using the **Long-range Energy Alternative Planning (LEAP)** methodology, provide base-case and 'high growth' projections for Zambia's electricity consumption out to 2030.

The base-case forecast sees demand rising to **16,000 GWh** by 2020 and to **26,000 GWh** by 2030, while the high-growth projections are **24,000 GWh** and **47,000 GWh** respectively. This last figure is over four times consumption in 2016.

- Kabila and Eberhard (2013) provide peak demand and energy consumption forecasts up to 2030 that are similar. They project peak demand of around 2,800 MW by 2020, rising to almost 4,000 MW by 2030. Energy consumption is forecast to reach 17,000 GWh by 2020 and 23,000 GWh by 2030, i.e. in the same range as Tembo and Merven's base-case scenario.

- The Seventh National Development Plan (2017-2021) predicts peak demand of **3,000 MW** by 2021 and at least **3,525 MW** by 2030.

Figure 1: Indicative electricity demand forecast to 2033



PMRC has conducted demand forecasting for the period up to 2033 by modelling household demand and demand from economic sectors to project future potential energy requirements using 2015 as a baseline. The base case represents an assumption of a **4%** annual increase in household income and sectoral growth of between **2%** and **4%** per year; the low case a **2%** annual increase in household income and sectoral growth of between **1%** and **2%**; and the high case a **6%** growth in household income and sectoral growth of between **3%** and **6%**. These forecasts show a significant growth in demand (which will also mean an increase in peak demand): the base case sees demand double by 2030 and the maximum forecast sees demand nearly triple. Increased demand is driven by domestic consumption as the population grows, incomes rise and access to electricity increases to **75%** of households by 2033, as the Government drives rural electrification in line with its master plan, with demand potentially increasing fivefold to over **20,000GWh** by 2033.[1]Growth across sectors could see economic demand roughly double from 2015 to nearly **15,000GWh** ***(see Appendix A for more information about the model)***.

1. Note that as these lower income households access the grid, average demand per household will decrease, thereby offsetting the effects of income growth; as this forecast accounts for this effect, it is somewhat less than others.

INSUFFICIENT CAPACITY

Historically, capacity has struggled to remain ahead of peak demand. Peak demand for electricity in 2017 was **2,300 MW**. While nominal capacity was over **2,800 MW** (Table 1), not all plants are available at their full capacity all the time, and using an 80% de-rating factor, operating capacity is more in the region of **2,250 MW**. International good practice would be to seek to maintain a de-rated capacity margin (i.e. capacity net of peak demand) of **10-15%**. While Zambia has added capacity – most recently with **420 MW** from Maamba and Itezhi-Tezhi in 2016 – more is urgently needed.

Table 1: Electricity generating capacity in 2017

	TYPE	CAPACITY (MW)
Kafue Gorge	Hydro	990
Kariba North	Hydro	720
Kariba North Extension	Hydro	360
Victoria Falls	Hydro	108
Lunzua River	Hydro	14.5
Lusiwasi	Hydro	12
Chishimba Falls	Hydro	6
Shiwang'andu	Hydro	1
Itezhi-Tezhi	Hydro	120
Mulungushi	Hydro	32
Lunsemfwa	Hydro	24
Zengamina	Hydro	0.75
Maamba	Coal	300
Bancroft-CEC	Diesel	20
Luano-CEC	Diesel	40
Luanshya-CEC	Diesel	10
Mufulira-CEC	Diesel	10
Other small diesel	Diesel	8.6
Ndola	Heavy fuel oil	110
Samfya	Solar	0.06
Musonda Falls	Hydro	10
TOTAL		**2897.21**

Source: ERB 2017.

OVERDEPENDENCE ON HYDROPOWER AND VULNERABILITY TO FAILURE OF RAINS

Zambia is heavily reliant for electricity generation on one technology – hydropower. At the end of 2017, hydropower made up **83%** of installed capacity (ERB 2017), despite some recent diversification. This capacity itself is highly concentrated, with just three large hydropower plants at Kariba North, Kafue Gorge and Kariba North Bank Extension making up almost three-quarters of the country's total. All of these large plants (along with a number of smaller ones) are located within the Zambezi River Basin, meaning that the bulk of Zambia's electricity supply is dependent on rainfall in a single watershed. The new Itezhi-Tezhi plant is in the same watershed. In addition to the rainfall failures in 2014 and 2015 that led to recent power shortages, there have been previous droughts in 1991-92 and in the early 2000s with similar effects (Kapika and Eberhard 2013), suggesting that Zambia experiences drought and accompanying power shortages roughly once every decade. Moreover, modelling of trends in the Basin suggests that hydropower potential will gradually decline in future, due to climate change and increasing water demand from other sources (Yamba et al 2011). This modelling suggests, for example, that the potential of Lake Kariba may fall by one-third by 2030.

POWER SHORTAGES

The combination of demand growth outpacing capacity and heavy reliance on hydropower makes Zambia vulnerable to periodic crises of power supply, most recently in 2015/16. In recent years the system load factor has been remarkably high, reaching nearly 90% in 2013 and 2014. The deficit in output relative to demand hit a high of 1,000 MW in 2015, declining to 526 MW in 2016 (ERB 2016). Despite importing electricity from neighbouring countries at a cost of over **US$350 million** ***(World Bank 2017)***, ZESCO could not meet the shortfall and had to implement power rationing. The economic impact was severe, with key

THE WORLD BANK

US$ 350 Million

economic sectors such as mining, manufacturing and agricultural sectors scaling down production and employment as the intensity of the blackouts increased and imported energy became expensive. One estimate of the economy-wide effects is that economic losses were equivalent to around **20%** of annual GDP ***(Samboko et al 2016)***. A study of the impact of load-shedding on small to medium sized enterprises showed that over **80%** were affected, at an average cost of almost **K20,000** per enterprise, and with up to a third of businesses having to use back-up diesel generators ***(Mwila et al 2017)***. Households on the other hand endured up to 12 hours of daily load-shedding at the peak of the crisis in

July 2016. Power shortages not only damage the economy through decreased production or increased electricity costs but also create a fiscal burden as government attempts to make up the shortfall through expensive imports.

LOW RATES OF ELECTRICITY ACCESS IN RURAL AREAS

The challenges above relate only to those sections of the Zambian economy and society which have access to electricity, but these are still in a minority, and large numbers of Zambians, especially in rural areas, have yet to get access to electricity. Recent estimates are that a little under half of the urban population have electricity access ***(USAID 2015)***, and only **4.4%** of the rural population have access to grid electricity, with **7.4%** having access to solar power ***(Musonda 2017)***. The target for rural access under the Rural Electrification Master Plan is **51%** by 2030, but progress is slow because access has to be expanded faster than population growth to improve the proportion served. The huge scale of expansion envisaged should be applauded but is another reason why generation capacity needs to be radically expanded.

These challenges are all recognised in the Seventh National Development Plan 2017-2021 ***(GRZ 2017)***. The Plan states that the current situation has arisen from 'inadequate and delayed investments in generation and transmission infrastructure' and recognises the compounding effect of 'inadequate incentives to attract investment.' By calling for 'measures to grow and diversify the energy sector'; it is clear that private sector investment through IPPs can meet in this ambition, while minimising the impact on government finances.

3. THE ROLE OF PRIVATE SECTOR INVESTMENT IN ZAMBIA'S ELECTRICITY SECTOR.

As noted in the 7NDP, there is widespread agreement that Zambia has plentiful resources for electricity generation, including hydropower, solar, biomass, geothermal and coal (see also PMRC 2014, Energy Studies Institute 2016). The challenge is getting investment in power plants that can convert these resources into useful electricity. There is no shortage of potential pipeline projects *(see Table 2).* However, many of these projects may never reach completion.

TABLE 2
ON NEXT PAGE

Table 2: Potential pipeline of new capacity – selected major projects

Project	Type	Expected completion	Expected capacity (MW)
IDC Solar	Solar	2018	100
IDC Solar	Solar	2018	300
Maamba	Thermal	2021	270
Chipata Thermal	Thermal	2023	180
Muchinga	Hydropower	2025	162
Kalungwishi	Hydropower	2026	235
Ngonye Falls	Hydropower	2026	117
Kafue Gorge	Hydropower	2027	713

Source: Kukula Consulting

Historically, Zambia's approach has been for the Government, via ZESCO, to undertake investment in capacity. The Government has also led the recent **Zambia Power Rehabilitation Project (PRP)** which involved various capacity and transmissions upgrades as well as demand side management measures. With a budget of more than **US$ 75 million**, it was supported by the **World Bank**, **European Investment Bank (EIB)** and ZESCO. However, the main efforts were concentrated around refurbishment of existing hydropower facilities and transmission lines which resulted in an effective increase of available generation by about **100 MW**, but this has not been sufficient to close the power supply gap.

The ability of **ZESCO** to undertake new investments has also been constrained to a degree by its ability to raise capital, which in turn is linked to its financial situation. A major potential factor affecting ZESCO finances are how cost reflective tariffs for electricity are. For many years Zambia has had low electricity prices by comparison with its neighbours. However, following the development of a draft multi-year tariff framework by the ERB in 2016 and an application by ZESCO to raise its tariffs, the ERB took the decision in May 2017 to grant a **75%** increase in customer tariffs in two phases between May and September 2017. However, it is unclear how far this move has improved ZESCOs financial position (or whether the revenue has gone into general government budget) as ZESCO does not produce regular financial reports. It appears that it remains dependent on the Government to finance new investments, such as its share in the Itezhi-Tezhi hydropower scheme, with ZESCO's publicly guaranteed debt rising sharply in recent years *(IMF 2017)*. However, this strategy is unlikely to be sustainable, as the Government's own debt situation has also worsened.

This mix of factors points to the need for Zambia to attract more private investment in the electricity sector, through public-private joint ventures or through investments by

independent power producers (IPPs) who sign long term power purchase agreements with ZESCO. Zambia has already started to see some investments of this type. Currently operational IPPs, all selling power to ZESCO under long-term power purchase agreements (PPAs) are shown in Table 3.

Table 3: Existing IPP and PPP investments in Zambia

Plant	Type	Owner	Capacity (MW)	Date commissioned
IPP investments				
Maamba	Coal	Maamba Collieries	300	2016
Ndola	Heavy Fuel Oil	Ndola Energy	110	2013
Lunsemfwa	Hydro	Lunsemfwa Hydro Power Company	24	Privatised in 2001
Mulungushi	Hydro	Lunsemfwa Hydro Power Company	32	Privatised in 2001
Zengamina	Hydro	Charles Rea	0.75	2007
PPP JVs				
Itezhi-Tezhi	Hydro	ZESCO/Tata Power of India	120	2016

Sources: ERB (2017), Kukula (2017)

In addition, Copperbelt Energy Corporation Plc (CEC) is an independent power company that purchases power from ZESCO under a bulk supply agreement and supplies the mines, in the Copperbelt region via its own transmission and distribution network. CEC also owns standby gas turbines with a capacity of **80 MW** and a regional control centre located in Kitwe, and exports power to the Democratic Republic of Congo (DRC).

Table 3 shows that the scale of private investment in generating capacity has increased in recent years. Three major projects (Maamba, Ndola and Itezhi-Tezhi) have all been commissioned within the last five years. As noted above ***(see Table 2)***, there are also many other potential projects, some of which could involve private backers. However, given the scale of the challenge outlined in section 2, there is an urgent need to attract more private sector investment. It is also essential that this is done in a strategic, cost-effective way to meet the need to diversify energy generation and ensure that Zambian consumers do not end up paying more for electricity than they need to.

4. ACCELERATING INVESTMENT - LESSONS FROM COMPARATIVE EXPERIENCE

In principle there is a great deal of interest from companies seeking to invest in the electricity sector in Zambia: for example, the February 2018 launch event of the **GET FiT** solar programme was oversubscribed by a factor of two. However, Zambia has as yet relatively

little experience in this area. Much can be learned about how to accelerate good quality, cost-effective investment by Independent Power Producers (IPPs) from looking at the experience – both good and bad – of neighbouring countries in Africa. PMRC has reviewed the track record of a number of countries, including **Uganda**, **Kenya**, **Tanzania** and **South Africa**, as a way of assessing the situation in Zambia and options for reform. In this section we first briefly review the institutional organisation of the electricity sector in Zambia as a preliminary, and then consider the key lessons from comparative experience one by one.

LEGAL FRAMEWORK AND ERB

There are two statutes that together regulate the energy sector, both enacted in 1995. Amended in 2003 by the **Energy Regulation (Amendment) Act, No. 23 of 2003**, **the Energy Regulation Act (Cap 436)** is established the ERB and defined its powers and functions including licensing, monitoring efficiency and performance of licensees, and handling complaints.

The Electricity Act Cap 433, similarly amended in 2003 by the Energy Regulation (Amendment) Act, provides the regulatory framework for the generation, transmission, distribution and supply of electricity. It also sets out the ERB's regulatory duties and responsibilities to issue requirements for establishing generating stations, approving changes in capacity and charges and managing licenses.

The Electricity Bill 2014 and Energy Regulation Bill 2014 are in Parliament, and have the aim of the sharpening the regulatory tools for setting tariffs by expressly providing the ERB powers to do so for the first time, as well as powers to enforce efficiency improvements when assessing tariff submissions. Amendments to the Bills offer a vehicle for improving the way that the regulatory framework promotes private sector investment through IPPs.

POWER COMPANIES

ZESCO is a vertically integrated power utility carrying out generation, transmission distribution and supply of electricity. It is wholly owned by the Government through the **Industrial Development Corporation (IDC)**, a state-owned investment holding corporation. ZESCO dominates the electricity sector in Zambia. It operates the electricity grid and is responsible for much of the country's power generation from four large hydro power plants (i.e. Kariba North Bank, Kafue Gorge, Kariba North Bank Extension and Victoria falls) five small and mini hydro plants (i.e. Lusiwasi, Musonda falls, Shiwang'andu, Chishimba falls and Lunzua) and two diesel power plants (Luangwa and Shang'ambo).

Independent Power Producers (IPPs). The operational IPPs providing power through ZESCO under long-term power purchase agreements (PPAs) are:

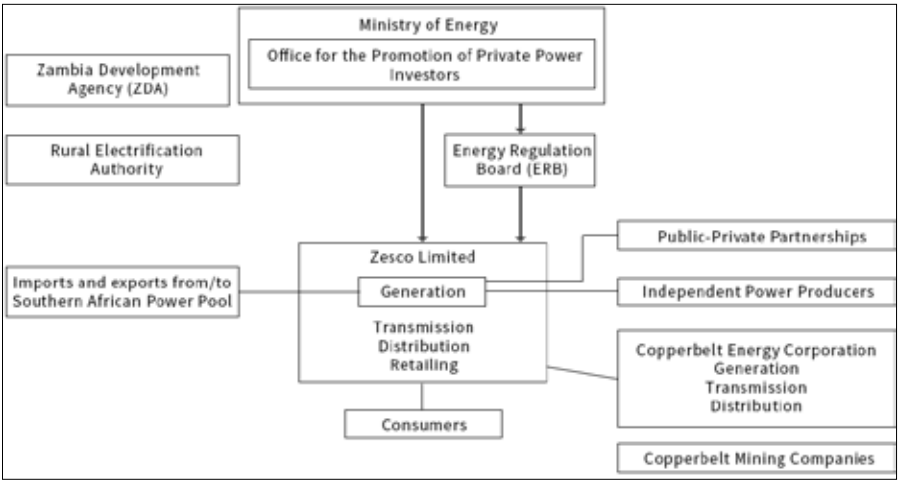
- Lunsemfwa Hydro Power Company Ltd (56 MW)
- Ndola Energy Company Limited (110 MW, heavy-fuel oil (HFO)
- Itezhi-Tezhi Power Corporation (120 MW, hydropower)
- Maamba Collieries Ltd (300 MW, coal-fired)
- Additionally, the Zengamina Power Limited, an off-grid mini hydro power plant, is licensed to generate, distribute and supply a rural area in North Western Province

Copperbelt Energy Corporation Plc (CEC) is an independent power company that purchases power from ZESCO under a bulk supply agreement and supplies the mines, in the Copperbelt region via its own transmission and distribution network. It also exports power to the Democratic Republic of Congo (DRC). CEC also owns standby gas turbines with a capacity of **80 MW** and a regional control centre located in Kitwe on the Copperbelt. North Western Energy Corporation Limited (NWEC) is also a licensed electricity distributor near Kalene Hill, Mwinilunga district in North Western Province of Zambia; it is also supplied by ZESCO. The overall power generation capacity of the national electricity grid was **2,886 MW** as of 30 June 2017.

ELECTRICITY MARKET

ZESCO is the de facto single buyer in Zambia. CEC and NWEC are licensed to sell electricity but they purchase electricity from ZESCO. The Electricity Act Cap 433 states that the Minister may declare any transmission line to be a common carrier ***(Paragraph 4 (2))***. Though the third-party access and licensing regulations are necessary conditions for bilateral contracting between eligible consumers and IPPs/imports, the legislation is not sufficient. Additional requirements to allow bilateral contracting to take place include transmission use-of-system tariffs, rules governing the non-discriminatory dispatch of power plants connected to the grid, the introduction of balancing arrangements such that when the demand of the eligible consumer does not match the output of the IPP, the imbalance is provided by a third party and paid for by the parties that are out of balance, and criteria for defining consumers eligible to participate in a bilateral contract market.

Figure 2: Key actors in the Zambia electricity sector



While the ERB's development of a multi-year tariff framework and subsequent approval of a **75%** increase in customer tariffs in May 2017 has made the investment environment more attractive by making tariffs more cost-reflective, government needs to make further reforms in order to attract more investment and secure it strategically and cost-effectively. Lessons are available from around Africa, for example South Africa, which has developed three wind projects between 2010 and 2014 and made significant progress in the development of seven small hydropower stations.

4.1 PLANNING

A first lesson from the experience of a number of countries is that effective planning is important for minimising costs for consumers and making the most of IPPs. Ideally such planning should use tools that consider both generation and transmission, and identify the supply and demand-side investments needed to meet projected electricity demand at the least total cost over a certain period (typically 15–20 years), while also meeting associated policy objectives such as environmental sustainability.

However, the planning function in government has become dispersed and inconsistent:

- Up until the 2000s, ZESCO undertook power sector planning, most recently producing a master plan in 1998. Responsibility then passed to the MEWD, which finalised a Power System Development Master Plan in 2009 (Kapika and Eberhard 2013).
- It also appears that the transmission licences held by ZESCO and CEC in principle

require them to produce regular plans for the development of the integrated generation and transmission system, at least every two years, with a time horizon of no less than 15 years (ibid). However, such plans have not been produced.

- There does not appear to be a current masterplan, beyond the high-level intention expressed in the Seventh National Development Plan to expand capacity. In June 2016 the Energy Regulation Board (ERB) announced that it would undertake a Cost of Service study to provide a framework for accurately estimating "cost reflective tariffs" for Zambia. The Cost of Service study will effectively involve a least-cost planning exercise that would help update thinking.
- It is also the case that specific initiatives, such as the Scaling Solar programme run by the Industrial Development Corporation and the International Finance Corporation ***(World Bank Group)***, take place outside of normal planning frameworks.

However, ideally, power sector planning should not be a one-off periodic exercise, but a continuous, dynamic process of keeping up-to-date with technology costs, changes in demand trajectories and security of supply threats. The government should establish the planning function and properly resource it in terms of people, software and institutional capacity, thereby creating a strategic plan for increasing energy capacity in the country, with due consideration to the role of IPPs.

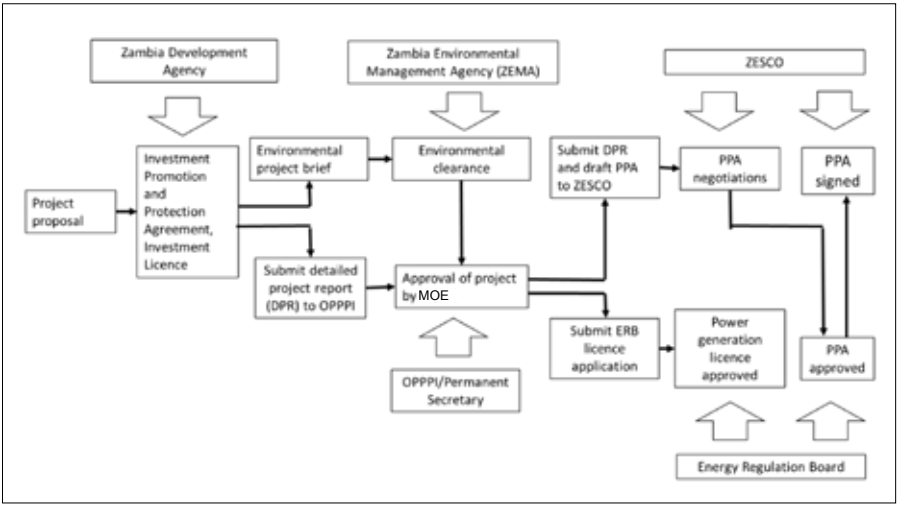
Experience suggests that effective planning also involves input from a broad range of stakeholders. For example, Kenya, one of the more successful countries in terms of attracting IPP investment, has involved stakeholders through the membership of a planning committee chaired by the energy sector regulator. For Zambia, this committee could support the planning function by bringing together the ERB, Ministries of Energy, Finance and National Development Planning, ZESCO, IPPs and representatives for business and consumers, and could be established through legislation requiring consultation on planning.

4.2 PROCUREMENT

For planning to play a useful role, it must be translated into appropriate investment and procurement decisions which encompass both the public and private sectors. However, few African countries have an explicit connection between planning and procurement.

One common problem is the involvement of more than one actor in procurement. The official process for an IPP seeking to get permission to make an investment and obtain a power purchase agreement and a generation licence is shown in Figure 2. In addition, potential investors may need to obtain permission to develop land with local and/or tribal authorities. They will also have to negotiate a connection agreement with ZESCO.

Figure 3: Process for IPP investment



Based on Kukula Consulting (2017)

This procurement process involves input and clearance from up to five different actors, including Government Agencies, the Ministry, ZESCO and the ERB. There are also some areas in which there are perceptions of a lack of clarity, for example, in the role of the Zambia Public Procurement Agency in approving PPAs.[2] The whole process can be expected to take a year at minimum, and in some cases up to four or five years, which acts as a barrier to entry and can increase costs for the consumer as investors use alternative routes to procurement that lack the same oversight.

While a few countries have used competitive bidding, a disproportionate share of IPPs in Africa are developed based on unsolicited proposals and through direct negotiation. This has generally been the case in Zambia. The risk here is that costs, and therefore prices for consumers, are higher as a result. Experience shows that competitive procurement processes produce lower costs, including ultimately for consumers. Eberhard et al (2017), reviewing 50 projects, find that diesel projects procured by an internationally competitive process are on average around **US¢10/kWh** cheaper than directly negotiated PPAs, while solar PV projects were around **US¢8/kWh** cheaper. Competitive procurement, such as reverse auctions, have also yielded lower costs for renewable electricity, such as wind and solar PV, than administratively set feed-in tariffs.

Within this picture, recent programmes **Scaling Solar and GET FiT (developed successfully in Uganda)** are a departure since they have taken a tendering and auctioning approach respectively which offer a streamlined and simplified process, in which successful

2. It should also be noted that, outside of the process illustrated in Figure 2, ZESCO has also entered into partnerships with private investors in joint venture projects, such as Itezhi-Tezhi (with Tata Power) and the Kafue Gorge Lower hydropower project (with Sino-Hydro and the China –Africa Development Fund).

IPP bidders benefit from standardised PPAs and packaged information about the best locations for grid connections, for example. There have been some challenges in getting a competitive field for Scaling Solar, but there are high hopes for GET FiT. In December 2017, GET FiT Zambia became the official implementation program for the Zambian Renewable Energy Feed-in Tariff (REFiT) Strategy. **GET FiT Zambia** is designed to assist the Zambian Government in the implementation of its REFiT Strategy. In line with this strategy, GET FiT Zambia aims to procure 200 MW of renewable energy projects within the next three years through small- to medium-scale Independent Power Producer (IPP) projects up to 20 MW, in line with the REFiT Strategy.

Where projects are directly negotiated, then measures to ensure value for money can also be taken. Eberhard et al (2016) cite the example of Kenya Power which historically used 'open book' processes, pre-specifying a capital structure for the project and expected returns on debt and equity, and comparing the resulting prices to other pricing benchmarks—such as feed-in tariffs (FiTs) and the prices resulting from competitive procurements.

Effective procurement processes lower barriers to entry for investors and secures investment in a way that meets the country's strategic needs for a diversified portfolio of energy generation and protects energy consumers through negotiating good value for money. The Government should establish a procurement function alongside the planning function, which has oversight of all procurement of IPPs. Increased oversight would improve transparency over contract negotiations and bring commercial specialists together. The Government would be better positioned to hold negotiations with IPPs, which have a great deal of commercial expertise, carry out more competitive tenders and develop a streamlined procurement process.

4.3 CREDITWORTHINESS OF OFF-TAKER

In many African countries, the state-owned utilities that are the off-takers of electricity from IPPs are in poor financial shape, because tariffs are frequently not cost-reflective, meaning that utilities cannot cover capital and operating costs. Also because of high losses in distribution lines and a poor record on revenue collection, a combination of factors that mean losses of up to half of a utility's turnover. Potential IPPs perceive substantial risk in

such conditions, especially the risk of non-payment if the utility is financially fragile. In the case of ZESCO, some concerns about non-payment to IPPs are expressed.

IPPs will tend to seek safeguards of some kind, including international arbitration, sovereign guarantees, ring-fencing of revenues or escrow accounts, loan or payment guarantees from international financial institutions (e.g. the World Bank, AfDB) and various types of insurance products. The direct involvement of development finance institutions in large-scale investment can also give private investors greater confidence. In the case of Zambia, some IPPs will seek guarantees from the Ministry of Energy. The packages for solar IPPs also offer risk mitigation facilities; e.g. GET FiT offers forms of insurance against termination of contracts.

However, in the longer term the financial health of off-taking utilities can be established on a more sustainable basis only through improved governance and management of utilities, and tariff reform in the direction of cost-reflexivity, or more credible guarantees that government will underwrite subsidies. ZESCO's financial performance is unclear but it has traditionally borne the expense of below-cost tariffs, power losses through transmission and distribution, at least some of the cost of expensive imports during the load-shedding of 2015-16. ZESCO has made progress through tariff reforms of 2017 and decreased power losses in distribution, which were **10%** in 2016, decreased from **13.8%** in 2011 ***(Energy Studies Institute, 2016)*** (but still above international good practice in the range of **4-8%**). However, without better financial reporting it remains unclear how far these reforms have improved ZESCO's financial position (or whether the revenue has gone into general government budget). In the short-term, increasing transparency over ZESCO's finances can reassure investors and drive improved financial management as the organisation improves its governance and management of utilities, continues to increase tariffs to be cost-reflective and pursues more credible guarantees.

In the long-term, the government could consider using the Electricity and Energy Regulation Bill to allow power producers to supply directly into the grid. This would provide suppliers with an alternative purchaser to ZESCO, although it would not be attractive in the short-term as ZESCO buys electricity at a higher tariff than it sells to consumers.

4.4 INDEPENDENT REGULATOR

The existence of transparent, fair and accountable regulators that produce credible and predictable regulatory decisions is necessary for creating the certainty around market access, tariffs, and revenues that encourages investment. Ideally, an independent regulator should enforce best practices in investment transactions and notably competitive procurement. High quality regulators will also have the capacity to undertake the regulatory changes, for example in grid codes, which are needed for facilitating the introduction of intermittent renewable sources of electricity into the system.

In Zambia, the presence of a regulator has not necessarily translated into competitive procurement practices, resulting into captive electricity consumers not benefiting from the pass-through of competitive generation prices. In recent years the ERB has also undertaken significant measures to improve ZESCO's performance, first in establishing a system of Key Performance Indicators, against which it monitors and reports on compliance, and secondly in approving tariff reform in 2017 (although this reform was ultimately dependent on the backing of the President). If the ERB promotes best practice across the sector, it will be able to serve both investors and consumers

An independent regulator is better able to manage the market in the common interest of investors and consumers. The ERB has existed as a formally independent regulator since 1996. In theory, the Board's Members are appointed for five-year terms, although there have been occasions in the past where the Minister has removed Members ***(Kapika and Eberhard 2013)***, suggesting that the degree of independence in practice is somewhat weaker. The ERB has a degree of financial independence from the Government, as the bulk of its income comes from licence and application fees, and in practice it has tended to be adequately funded (ibid). The government could undertake measures to improve the independence of the regulator by having the board rather than the Minister of Energy agree its terms of service and establishing an appeals tribunal, as well as updating legislation to secure its independence.

5. CONCLUSION

Following poor rainfall in 2014/15, the country experienced extensive load-shedding from 2015-16, with households experiencing twelve hours of blackouts at its peak in July 2016. Power shortages impacted every corner of the economy from the key economic sectors, mining, manufacturing and agriculture, which scaled back production and made redundancies, including small and medium sized enterprises, which experienced average costs of **K20,000**. The total impact has been estimated to have been equivalent to **20%** of GDP in economic losses. The severe cost of power shortages demonstrated the urgent need to improve energy capacity and diversify from hydropower, which provides over **80%** of the country's power.

The Government has successfully stabilised the country's energy position since 2016. However, Zambia cannot afford to be complacent. Demand for electricity will only grow, driven by domestic consumption as population, income and electrification levels rise and underpinned by economic growth: this paper forecasts that demand will likely double, and may even triple, by 2030. Moreover, the country's debt position has limited the scope for the government to increase capacity through public and utility investment as it has done traditionally. It is instead imperative that the government look to private-sector investment to meet Zambia's energy generation needs.

The amount of power generated by IPPs has increased in recent years, and the government should be applauded for reforming tariffs to make them more cost-reflective, which will support this growth. However, more must be done to ensure to make the sector more attractive to investment and improve government capacity to secure a productive, cost-effective and diversified portfolio of IPPs. Investors currently face high-barriers to entry due to the lengthy and complicated procurement process in place and are discouraged by uncertainty over the performance of ZESCO and the regulator. Moreover, government does not currently employ best practice in planning and procuring investment as the Ministry of Energy lacks both a comprehensive strategy and oversight over implementing it, with too much investment secured through one-off, direct negotiations rather than competitive tenders, which risks raising prices for the consumer.

This paper makes four recommendations for securing more private sector investment in the Zambia's power sector:

1. **Establish a central planning function,** most obviously in the Ministry of Energy, to develop a strategic vision and delivery plan for increasing and diversifying power capacity in the country through investment in IPPs.

2. **Establish a central procurement function** to sit alongside the planning function and secure investment in line with the Government's strategic vision. The procurement process is lengthy and opaque, which has discouraged investment across the board and created an environment in which deals are made through unsolicited direct negotiations. The planning function should look to centralise commercial capability, run more competitive tenders and streamline the procurement process, which will lower barriers to entry for investors and deliver value for money for consumers.

3. **Improve the credit-worthiness of ZESCO:** as the sole off-taker, it is essential that investors have confidence that the organization can purchase the energy generated, which can be improved through increased financial transparency and providing more secure guarantees.

4. **Develop the governance of the ERB to improve its independence** and, therefore, its effectiveness in serving investor and consumer interests. The Government should consider having the board rather than minister agree its terms of service and establishing an appeals tribunal, as well as updating legislation to secure its independence.

APPENDIX 1 – DEMAND FORECAST MODELLING

The PMRC modelling exercise for forecasting demand has two elements: household demand and demand from economic sectors.

Household demand is estimated on the basis of expected growth in the number of households, an increasing electrification rate based on the Rural Electrification Master Plan for 2030, household income growth and an associated income elasticity of demand for electricity, and an adjustment for falling demand per connection driven by the connection of poorer households and by energy efficiency measures. The base case for household demand assumes annual growth of household income of 4%; the low and high cases assume 2% and 6% respectively.

Demand form economic sectors, including mining, is forecast on the basis of electricity intensity of output and growth of output in the sector. Growth assumptions for base case, low and high cases are shown in the table below:

Table 4: Growth rates (%/year)

	LOW	BASE CASE	HIGH
Household income growth	2	4	6
Agriculture	1	2	3
Mining and quarries	2	4	6
Manufacturing	1	3	5
Electricity, gas and water	1	3	5
Construction	1	3	5
Trade	2	4	6
Transport	2	4	6
Finance and property	2	4	6
Others	2	4	6

Full details of the modelling and sources are available on request.

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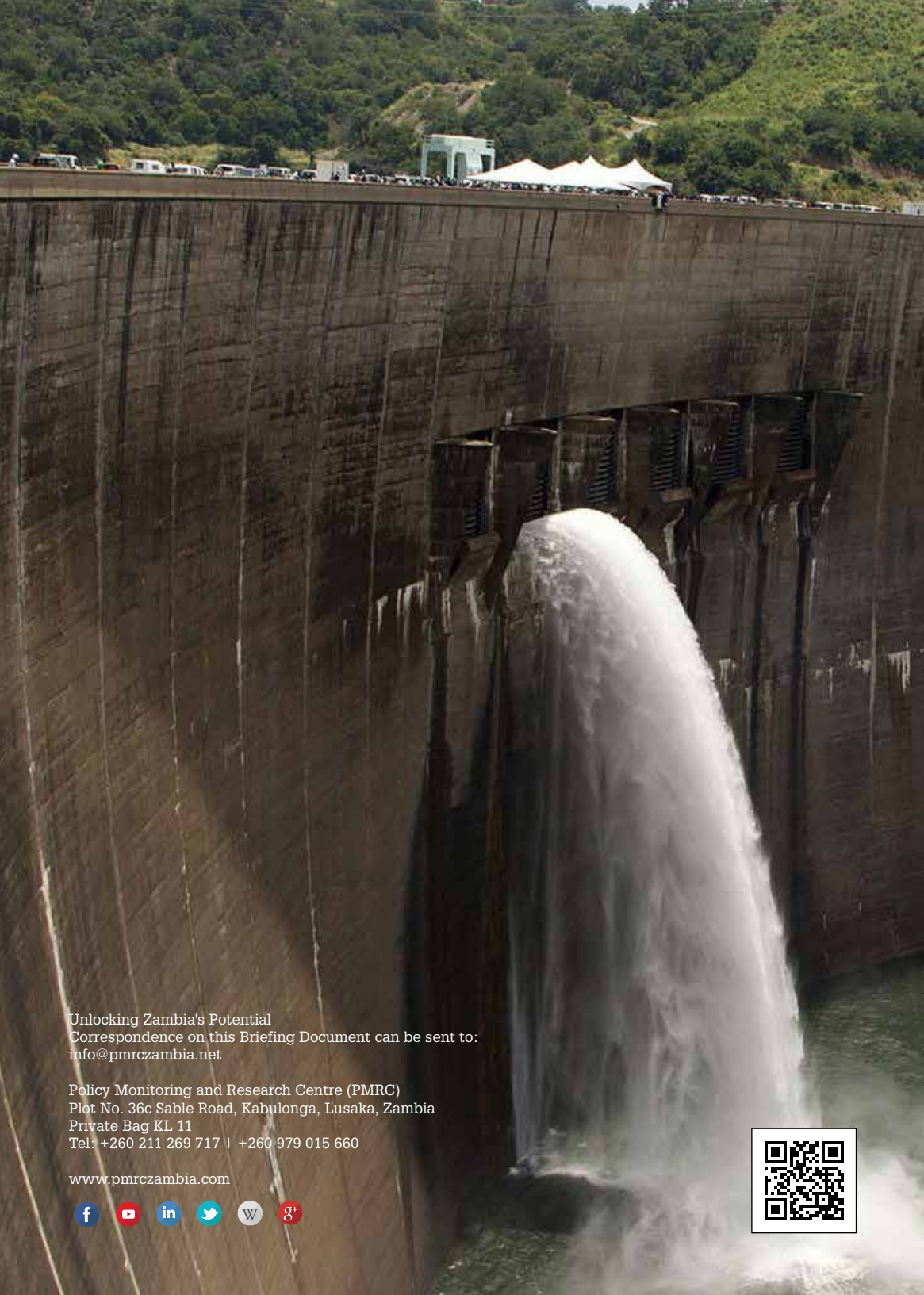

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