Chapter 3

Zambia: looking east for additional generation capacity

Established in 1995, Zambia's Energy Regulation Board (ERB) is one of the oldest electricity regulatory agencies in Africa. Despite this, the technical and financial performance of Zambia's national state-ownd utility, ZESCO Ltd remains poor. Tariffs are not cost-reflective and are among the lowest in the world. For many years, the government of Zambia was reluctant to allow tariffs to rise. There was surplus generation capacity in the early 1980s, consumption and demand growth were stagnant as a result of economic decline, and there seemed no reason to increases prices. Although the country's fortunes changed towards the end of the 1990s, tariffs still did not increase significantly. The first decade of the new millennium has seen robust economic growth and a rapidly rising demand for electricity. But with tariffs below economic levels constraining investment in refurbishment and system expansion, power quality and reliability has declined and load shedding and even nationwide blackouts are more common. Both the ERB and government have since recognised the need to raise tariffs to levels that will make the electricity-supply industry sustainable, and contribute more meaningfully to economic development. Above-inflation increases were awarded in 2008 and 2009, and a path towards cost reflective tariffs has been established. Greater effort has also been placed on improving ZESCO's performance, and a set of key performance indicators has been developed against which the company is being measured.

Meanwhile, the successful privatisation of the Copperbelt Energy Corporation (CEC) (which supplies electricity to the Zambian copper mines), and its subsequent resale to a consortium led by local investors, has provided an example of new avenues through which the sector can be funded, and has facilitated the emergence of an indigenous, private managerial class. Nonetheless, with the exception of remote stand-alone concessions, there has been no private-sector participation in 'greenfield' generation projects, even though the sector was liberalised in 1995. Kariba North Bank, commissioned in 1977, remains the country's newest plant.

The second decade of the millennium may herald the start of a brighter future, however. ZESCO has entered into new partnerships with state-backed Chinese and Indian investors. For example, the Kariba North Bank hydro power station is being expanded by Sino-hydro, China's Exim Bank and a Development Bank of Southern Africa loan. The Chinese are also once again involved in the Kafue Lower Gorge hydro scheme. And the Itezhi Tezhi hydro plant is being developed by Tata Power from India. Alternative models for financing the power-supply deficit are thus emerging, and there is renewed private-sector interest in other generation projects.

It is a time of great hope; and the continent's oldest regulator has a key role to play in ensuring that the Zambian power sector becomes more viable, efficient, and able to reliably provide quality electricity not only to the country, but also the region.

An overview of Zambia's Electricity Sector

The institutional arrangement of Zambia's electricity sector is depicted in Figure 3.1. The Ministry of Energy and Water Development (MEWD) is responsible for policy development. The Energy Regulation Board (ERB) is the independent regulator. As is the case in Kenya, Tanzania and Uganda, there is a quasi-independent body charged with extending electrification in the rural areas, the Rural Electrification Agency. The Office for the Promotion of Private Power Investment (OPPPI) is a distinctive feature of the Zambian set-up. OPPPI is a specialised unit within the energy ministry that aims to promote private-sector investment in generation and transmission, and to manage the attendant and complex planning, procurement and contracting processes.





Zambia's hybrid electricity market¹ is dominated by the state-owned and vertically integrated ZESCO Ltd. As at 2010, the only private generation into the grid was provided by Lunsemfwa Hydro Power Company (LHPC), which owns two small hydropower plants just outside the Central Province town of Kabwe. There are also two rural concessions – Zenagamina Hydro Power Company (ZHPC) runs a remote rural network in the North Western Province and North West Energy Corporation that distributes electricity to a rural mining community that is not on the ZESCO grid. A unique feature is that the power supply to Zambia's largest load centre, the mines of the Copperbelt Province, is provided by a private company, the Copperbelt Energy Corporation (CEC). CEC purchases power from ZESCO and supplies the mines, smelters and refineries via its own transmission system.

The Zambian power system is also connected to that of the Democratic Republic of Congo (DRC) to the north (where electricity generating potential is estimated at 100 000MW),² and to the power systems of Namibia and Zimbabwe to the south. These interconnections enable power imports and exports, but more crucially position Zambia as the gateway for the flow of power from the DRC to countries to the south including South Africa, which is by far the largest consumer of electricity on the continent.

Generation capacity and demand forecast

With an estimated at 6 000MW³ of potential capacity, Zambia has an abundance of hydro resources. It is not surprising then that installed generating capacity is almost entirely based on hydropower.⁴ As shown in Table 3.1, Zambia's total installed capacity in 2010 stood at 1 889MW. Hydrological constraints, and the state of hydroelectric equipment, mean that available generation capacity is slightly lower.

Ownership	Plant	Installed capacity (MW)	Туре
ZESCO	Kafue Gorge	990.0	
	Kariba North Bank	720.0	Hudro
	Victoria Falls	108.0	пушо
	Lusiwasi	12.0	
	Musonda Falls	5.0	Small hydro
	Chishimba Falls	6.0	Sillali liyulo
	Lunzua	0.8	
LHPC	Lunsemfwa	18.0	Small bydro
	Mulungushi	29.0	Sinan nyuro
Total capacity		1 888.8	

Table 3.1: Installed generating capacity, Zambia 2010

Source: ZESCO, personal communication (2010)

Note: A fire at Kariba North Bank in 2009 resulted in one generating unit being out of service for repairs. At the time of writing, the unit was still out of commission and actual available capacity was thus reduced to 540MW.



Figure 3.2: Gross electricity generation (GWh), Zambia, 1982–2008

Source: ZESCO, Personal communication, 2010

Zambia's dependence on hydropower puts the country at risk in the event of drought. Over the period 1982 to 2008, the most significant drought event occurred in 1991 to 1992 (Tiffen and Mulele, 1994) when gross generation output decreased by nearly 30 per cent (see Figure 3.2). There were also intermittent droughts over the first five years of the new millennium (Nyambe and Feilberg, 2009).

Other than in 1991 and 1992, the impact of drought has not been as severe as experienced by the East African countries discussed in this volume. This is due to water storage capabilities⁵ and electricity imports from Southern African Power Pool countries that have helped in alleviating the shortfalls in power generation.⁶

As expected in a developing country, the load forecast for the period 2010 to 2030 (Figure 3.3) shows strong growth with maximum demand and energy growth averaging at 4.5 per cent and 3.9 per cent per annum respectively. It is noteworthy that the forecast maximum demand for 2010 (at 1 801MW⁷) is perilously close to actual installed capacity, and if this level of demand materialises, the reserve margin will be insufficient for prudent system operations.



Figure 3.3: Load forecast, Zambia, 2010–2030

Power-sector reform

To provide some context to the reform process in Zambia, it is helpful to trace the complex history of Zambia's power sector, the development of which spanned three countries, was largely driven by the need for a reliable electricity supply to the mining industry, and has been significantly influenced by the World Bank (which has been the industry's most important funder for over half a century). Indeed, as for all of the countries in this volume, it can be argued that power-sector reform was not an event but an ongoing process.

History of the power sector

In 1906, Zambia's first power station, a thermal plant, was built in Livingstone, the country's southernmost town, and home of the Victoria Falls. Later, several stand-alone generating stations were installed on the Copperbelt in the period leading up to World War II (Mihalyi, 1977). Hydropower only began to be harnessed when a 2MW generator was installed at Mulungushi power station in 1925, followed by two other 6MW generators in 1927.⁸ This hydropower was used to supply electricity to the lead and zinc mine at Kabwe (Broken Hill) (Mihalyi, 1977).

Surprisingly, despite proposals to exploit the Victoria Falls that date as far back as 1895,⁹ it was only in 1938 that a hydro-electric plant was installed on the third gorge below the falls.¹⁰ From then on, hydropower took hold. A further 6MW unit was installed at Mulungushi in 1941,¹¹ and four years later, two generators rated at 6MW each were commissioned at Lunsemfwa power station, 47km north east of Mulungushi to supplement supply to the lead and zinc mines at Kabwe. The 1950s saw three important developments in the sector. Firstly, interconnected grid supply was initiated through the connection of four power stations with a combined capacity of 120MW on the Copperbelt.¹² Secondly, in 1956 hydropower began being imported, when a transmission line was laid from Katanga in the neighbouring Democratic Republic of Congo (then the Belgian Congo) to Kitwe on the Copperbelt.¹³ This led to the establishment of the Rhodesia Congo Border Power Company by the mining companies, for the purpose of operating the transmission line and distributing power on the Copperbelt.¹⁴ (This company was renamed the Copperbelt Power Company (CPC) in 1964.¹⁵) Thirdly, an event that has left a lasting impression on the country and region's power sector was the decision by the government of the Federation of Rhodesia and Nyasaland¹⁶ to construct a dam on the Zambezi River at Kariba Gorge, that would straddle northern and southern Rhodesia and create a reservoir from which to supply hydro-electricity to the mines on the Copperbelt (Jarosz, 1992).

The construction of Kariba dam began in 1954, and in 1962, the 666MW Kariba South Bank power station was commissioned.¹⁷ At the time, Lake Kariba was the largest reservoir in the world (Jarosz, 1992). Kariba South Bank power station came to be owned and operated by the Central African Power Corporation (CAPCO), set-up by the governments of Zambia (Northern Rhodesia) and

Southern Rhodesia in 1963. CAPCO was established to be responsible for bulk power generation and transmission, and so it also owned the power lines and high voltage substations en route to the Copperbelt. In Zambia, CAPCO, which supplied almost all of the country's power requirements, had two customers: the Central Energy Corporation supplying Lusaka and surrounds; and CPC on the Copperbelt.

In 1967, three years after Zambia's independence, work began on the first indigenous large hydropower project, the 600MW Kafue Gorge power station,¹⁸ and was completed in 1972 (Mihalyi, 1977). In 1973, work began on a dam 250km upstream of the Kafue River to increase capacity at Kafue Gorge by a further 300MW. By 1977, capacity at Kafue Gorge had been increased to 900MW and Zambia was home to a new reservoir at Itezhi-Tezhi (World Bank, 1985). Meanwhile, the second (60MW B Station) and third (40MW C Station) plants at Victoria Falls were commissioned in 1969 and 1973 respectively (Mihalyi, 1977).

At the beginning of December 1969 the government formed the Zambia Electricity Supply Corporation (ZESCO) to be responsible for the generation, transmission and distribution of electricity throughout the country, with the exception of the areas that were being supplied by CAPCO. The following year, the Zambia Electricity Supply Act of 1970 became effective, and by statutory order of the minister responsible for electricity, the rights, obligations and assets of existing electricity utilities became vested in ZESCO. Thus on 1 July 1970, ZESCO acquired the Central Energy Corporation, the Northern Electricity Supply Corporation that supplied small towns by isolated diesel generating stations and the Victoria Falls Electricity Board (VFEB), which owned the power stations at the falls. Two years later, on 1 July 1972, ZESCO acquired municipal operations in Livingstone and Ndola undertaken by the VFEB and Ndola Council Electricity respectively (World Bank, 1985). Later the same year, five other similar operations were taken over on the Copperbelt, and by 1985, ZESCO supplied the entire country with the exception of the Copperbelt mines and the lead and zinc mines at Kabwe (World Bank, 1985).

The last major generating plant constructed in Zambia was the 600MW Kariba North Bank power station (KNB). Ordinarily, the construction would have been undertaken directly by CAPCO, but the Unilateral Declaration of Independence by Southern Rhodesia in 1965, which Zambia did not recognise, meant that Southern Rhodesia's appointments to the CAPCO board, and to the Higher Power Authority¹⁹ to which the board reported, were also not recognised (IBRD and IDA, 1970). As a result CAPCO could not be authorised to procure funds for the project. To overcome this, the Zambian government formed the Kariba North Bank Company (KNBC) to procure a loan from the World Bank and to own the power station. KNBC in turn contracted CAPCO to construct the power station and on completion CAPCO agreed to lease the facility for a consideration adequate to meet KNBC's debt service and reasonable administration costs (International Development Association, 1974). The Kariba North Bank power station was commissioned in 1977, the year that two additional generators at Kafue Gorge also came into service. With these additions, total installed capacity in Zambia reached 1 608MW well above its maximum demand at the time. In fact, as late as 1982 Zambia's maximum demand was reportedly only 846MW.²⁰

In a curious arrangement, ZESCO sold all the electricity it generated to CAPCO which would then sell it back for onward distribution to ZESCO's customers throughout the country (International Development Association, 1974). This arrangement ceased in 1977 when the relationship between ZESCO and CAPCO was restructured. Thereafter it was agreed that:

- ZESCO would cease purchasing power from CAPCO;
- the benefits and costs of the Kariba Complex would be shared equally between the two parties;
- CAPCO's transmission costs in Zambia would be reimbursed by ZESCO;
- power supply to CPC would be undertaken by ZESCO; and
- that the arrangement where ZESCO had hitherto been purchasing power from CPC for its northern area operations would be replaced with a rental (wheeling) charge for use of CPC's transmission network on the Copperbelt (World Bank 1985).

In 1982, CPC became the Power Division of the newly formed and majority state-owned mining conglomerate, Zambia Consolidated Copper Mines (ZCCM),²¹ and in 1987, CAPCO was dissolved by the simultaneous passing of the Zambezi River Authority Act in the parliaments of Zambia and

Zimbabwe. The Act provided for CAPCO's electricity generation and transmission activities to be taken over by ZESCO and KNBC, and its responsibilities related to dam infrastructure reverting to a new entity, the Zambezi River Authority.²²

Technically, ZESCO had performed well since its establishment, and the quality and reliability of electricity service was maintained to high standards (ESMAP, 1988). But by 1988, these standards were at risk. Demand was declining due to a reduction in power exports²³ and local consumption growth was flat, and the combination created a strain on ZESCO's finances. The Zambian economy was in an overall state of decline, limiting access to the foreign exchange required to ensure adequate maintenance of its plants, and ZESCO faced increasing difficulty in attracting and retaining key staff (ESMAP, 1988). These difficulties were compounded by the fact that tariff levels were insufficient to provide adequate cash reserves for operations and maintenance, tariff adjustment procedures were lengthy and did not provide the flexibility required in an environment of rapidly rising inflation, and low employee productivity had made billing and metering problematic (ESMAP, 1988). Despite the fact that these risks had been flagged in 1988, by 1993 the company was headed for 'financial disaster' (Ranganathan and Mbewe, 1995).

In 1991, the government changed hands. The United National Independence Party (UNIP) that had led Zambia since independence in 1964, and which had followed statist policies of economic management, was voted out of power. The Movement for Multi Party Democracy, a party that had based its campaign on economic liberalisation and greater private-sector involvement in the economy, came to power. With the paradigm shift in economic management came a flurry of new economic policy statements. Hence in 1994, the government published the National Energy Policy (Ministry of Energy and Water Development, 1994), the first such statement wholly dedicated to the energy sector.

1994 Energy Policy

The policy's stated objective was:

Promoting optimum supply and utilisation of energy, especially indigenous forms, to facilitate the socioeconomic development of the country and maintenance of a safe and healthy environment [which would require] establishing a viable institutional structure (Ministry of Energy and Water Development, 1994: 20)

To achieve this objective, the policy outlined five measures specific to the electricity sector. The most far-reaching of these was the first, which stated that the electricity industry would be restructured to improve service delivery by:

- liberalisation so that other companies could be involved in the electricity business;
- ensuring that the operations of ZESCO would be commercialised; and
- the immediate privatisation of ZESCO's distribution function.

The policy also called for: the removal of bottlenecks to accessing electricity by, for example: reducing connection charges and deploying of low-cost technologies; the promotion of the electrification of productive areas and social institutions; the development of the country's hydropotential and taking advantage of Zambia's strategic location in the region; and a review of existing legislation so it would conform to the changed economic landscape (Ministry of Energy and Water Development, 1994).

Pricing received special mention in the policy stating that it should be based on fairness and equity that entailed:

- allocating costs among consumers according to the burden they impose on a delivery system;
- assuring a reasonable degree of stability and avoiding large price fluctuations from year to year;
- providing a minimum level of service to persons who are unable to afford the full cost; and
- providing a real return on the investment.

Specifically for the electricity sector, it was stated that tariffs would be based on long-run-marginalcosts that took into account: investment costs; operational costs; incentives for efficiency, reliability, safety and environmental standards; and profit. The policy sought to clarify institutional roles and responsibilities with the extraction of government from operational activities in the energy sector. The government through the Ministry of Energy and Water Development would:

- Provide and articulate policy guidelines to the energy sector;
- Develop and implement policy;
- Monitor developments in the energy sector;
- Integrate the energy sector into the national and regional developments; and
- Regularly review energy related legislation to bring it in line with developments in the sector and the economy as a whole.

The policy also called for the establishment of an independent regulatory body that would:

- receive representations from consumers and other interested parties on energy price adjustments and levels;
- ensure that energy price adjustments and levels are justified;
- consider appeals from individuals and institutions not satisfied with services provided by any energy company;
- arbitrate between the various stakeholders in the energy sector, and ensure that the interests of energy users and the public are safeguarded; and
- regulate against monopoly practices.

The World Bank was instrumental in the development of the policy which was crafted at a time when power-market reforms were seen as important for increasing economic productivity (ESMAP, 1996). It was therefore not surprising that a key gathering of African ministers of energy and finance with utility managers held in Johannesburg in 1995, including the Zambian energy minister and ZESCO's managing director, echoed the Zambian policy with the following statement:

Most sub Saharan African power sectors need to reform. The challenge is, once...pricing issues have been addressed, how to ensure that efficient pricing will be sustainable. Experience around the world suggests that the only way efficient pricing can be sustainable is by reforming the sector along market lines, removing governments from the business of producing and selling energy; allowing the private sector under competitive conditions to enter the sector, and, when competition is unlikely, regulating private companies as if they were under competition (i.e. incentive regulation). All of this requires a well-defined legal, institutional and regulatory framework, however. (quoted in ESMAP, 1996)

With the policy released, the government proceeded swiftly with its implementation, and repealed the 1970 Zambia Electricity Supply Act, which had been the foundation of ZESCO's establishment and its statutory monopoly. In its place, the 1995 Electricity Act became law. The provisions of this Act are elaborated on later in the chapter but fundamentally its effect was to liberalise the power sector. The 1995 Energy Regulation Act was enacted simultaneously, and led to the establishment of one of the first independent regulatory institutions in English-speaking sub-Saharan Africa. The Energy Regulation Board (ERB) became operational in 1996.

Privatisation of mining and electricity-sector assets

Also in 1996, as part of the economic reform programme, the government initiated the sale of its majority interests in its mining and some of its electricity assets (Coakley 1997). The most significant of these electricity assets was ZCCM's Power Division, the privatisation of which was now possible since the 1995 Electricity Act had liberalised the sector. There was considerable international interest in the Power Division, and in 1997, it was purchased for US\$50 million by a consortium (led by the UK's National Grid Company and the US-based Cynergy Corporation) and renamed the Copperbelt Energy Corporation (CEC) (Craig, 2001).

With this, the first private player entered Zambia's electricity market since 1970. In 1995 to 1996, ZCCM's power consumption, which was supplied by CEC, was approximately 5 000GWh with a peak demand of 500MW. This meant that CEC was purchasing a significant two-thirds of ZESCO's total generation (Coakley, 1997). This arrangement was anchored on a bulk-sale agreement entered into between CEC and ZESCO at the time of privatisation. Later, in 2006, the National Grid Company

and the Cynergy Corporation divested from CEC and their interests were taken up by a consortium of mainly local investors known as the Zambia Energy Corporation.

Also included in the assets earmarked for privatisation were the Mulungushi and Lunsemfwa power stations. These two plants were acquired by Lunsemfwa Hydro Power Company (LHPC) in 2001, which was owned by a consortium comprising Eskom (51 per cent), local investors Degarnier (29 per cent), and Wand Gorge Investment (20 per cent). In 2008, Eskom disposed of its interests in LHPC to local investors and the management team. At the time of writing, LHPC with an installed capacity of 38MW was the only private generator of electricity in Zambia.²⁴

The attempt to privatise ZESCO

By 1998, ZESCO's performance was poor. Although its transmission network was generally regarded as efficient, generator availability was low, and distribution was characterised by high losses.²⁵ Commercially, performance was described as 'extremely poor' with an unsatisfactory rate-of-return on assets and an inability to settle debts that was exacerbated by very low tariff levels and overstaffing. ZESCO's financial position was too weak to finance new investments, and this made increasing access to electricity, which at the time reached just 14 per cent of the population, almost impossible (World Bank, 1998).

It was not surprising therefore that ZESCO's performance began to feature ever more prominently on both the World Bank's and International Monetary Fund's (IMF) programmes in Zambia. After continued poor performance despite government-led turn-around initiatives – including a performance contract signed with ZESCO in 1996 which emphasised 'commercial operation and efficient technical supply' (World Bank 1998: 4) – the World Bank and IMF made the privatisation of ZESCO one of the conditions that would enable Zambia obtain debt relief under the Highly-Indebted Poor Country (HIPC) Initiative.²⁶ The two multi-lateral institutions stated that:

Attention has also focused on the need to complete the program of divestiture²⁷ in order to reduce the fiscal burden of public enterprises and extend the provision and quality of essential services. In that context the privatisation of ZESCO, the national power company, is particularly important in order to improve efficiency, reduce tariffs, and facilitate future economic growth (IMG and IDA, 2000b).

A study was thus commissioned to investigate options for the privatisation of ZESCO from which government would make a decision by the end of 2000 (IMF and IDA 2000b). The study was completed early in 2001 and proposed that ZESCO be privatised in two stages: namely, via a ten-year master concession followed by the outright sale or further concessioning of unbundled business units. The study recommended that during the master concession:

- ZESCO should be unbundled into generation, transmission, distribution, and rural electrification business units;
- Rural electrification should operate under a negative sub-concession under the master concession period once the master concessionaire has developed a program plan in conjunction with the Ministry of Energy and Water Development. (Under a negative sub-concession, the concessionaire would be paid a combination of an up-front and annual fee.)

The disposal of remaining assets at the end of the master concession should be as follows:

- Outright sale of small hydro power stations (Lusiwasi, Musonda Falls and Chishimba Falls) with preference for local investors;
- Joint-venture sale of a majority stake in Victoria Falls and Kafue Gorge Power stations;
- Concession of the high-voltage grid and wholesale marketing functions; and
- Concession or joint-venture sale of majority stake in the distribution subsidiary (Nexant Inc, 2001)

Meanwhile, the ERB had in 1999 initiated its own investigation into options for restructuring the power sector. Subsequently it presented its report to the government in November 2002. The ERB recommended what was termed the 'semi-competitive model'.²⁸ This entailed the vertical unbundling of generation, transmission and distribution, and allowed for horizontal separation across the three

functions. It made provision for an independent system operator, a power pool for short-term electricity trading and wholesale competition through contracting among generators, distribution companies and large consumers (Kapika, 2004).

But popular resistance to privatisation was rising. An editorial in the Zambian daily, *The Post*, made the following observation:

Despite having liberalized its markets, as dictated by the IMF and the World Bank, Zambia has still not started benefiting from it...Why should we privatize Zambia National Commercial Bank, Zesco Limited (electricity) and Zamtel (telecommunications) simply because the IMF and the World Bank want us to do so, even when the great majority of Zambians are opposed to it because they believe it is not in their best interest?²⁹

By 2003, privatisation was becoming increasingly risky politically, and after intense negotiations the government agreed with the World Bank and the IMF to put the divestiture in ZESCO on hold. ³⁰ It was decided instead to pursue a plan to commercialise ZESCO in the hope that this would achieve the same objectives as privatisation. It was also agreed that the performance of ZESCO against the plan would be reviewed in 2005 and if it proved unsatisfactory, privatisation would be placed back on the agenda (IMF and IDA, 2005). The commercialisation plan entailed the following broad measures:

- Legal: amendment of ZESCO's articles of association and the composition of its board to ensure independence from political interference and enhance commercial operation; amendments to the Electricity and Energy Regulation Acts in order to impart greater regulatory independence to the ERB; Development of a framework that would allow ZESCO to enter into partnerships with the private sector.
- Commercial: the formulation of a business plan; the collection of government's unpaid electricity bills; to operate without government financial support; constraining government guarantees on ZESCO's concessional debt to a limit of US\$40 million until the end of 2005; the settlement of outstanding tax liabilities. (IMF and IDA, 2005)³¹

In 2005, Zambia obtained debt relief under the HIPC initiative. This was made possible partly by the fact that progress as measured against the ZESCO commercialisation plan was deemed satisfactory (IMF and IDA 2005). A year earlier on 15 June, government had announced the merger of ZESCO with KNBC (Chambwa, 2004). ZESCO's dominant position in the power sector was now well entrenched; privatisation was banished and unbundling abandoned.

Sector performance

Having detailed the history and initiatives to reform Zambia's power sector we now examine performance of the electricity industry as a whole and that of the two major players ZESCO and CEC.

It is important to remember that for several years Zambia was a regional powerhouse of electricity exports as shown in Figure 3.4. The rapid increase in electricity use since 1997 means that the country no longer enjoys that status. In two decades, ZESCO has moved from a situation where a lack of demand growth adversely affected its financial position to one in which a lack of funds is preventing the capacity expansions required to serve rising demand. In fact, 'with the rapid development of new mines and industries, and growing household electricity needs, the country is experiencing power shortage[s] and load shedding' (World Bank, 2008). National power blackouts, unheard of in the 1980s and 1990s have become annual events that occurred in 2006, 2007, 2008 and 2009.³²

Figure 3.5 shows maximum demand and energy consumption over the period 1983 to 2009. Although the global recession at the end of 2008 meant that peak demand and consumption began to decline, indications are that electricity use is increasing again. It is interesting to note the number of years that Zambia experienced significant electricity surpluses and the speed with which this excess capacity diminished from 1997 onwards, changing Zambia's status as a regional powerhouse for electricity exports to one that experiences its own power shortages.



Figure 3.4: Electricity exports from Zambia, 1982–2008

Source: ZESCO, personal communication, 2010





ZESCO's financial performance

ZESCO's financial performance has been less than stellar since the early 1990s. At the end of a substantial rehabilitation project in 2006, the World Bank remarked that 'ZESCO's financial situation is unsustainable, and will, if allowed to continue, undermine its commercialization efforts and the viability of the power sector. There is urgent need for action on tariffs, including re-opening of the sales contracts with the mines.' (World Bank, 2006).

ZESCO's tariff to CEC was increased by 33 per cent in 2008 while retail tariffs were increased by 35 per cent in 2008 and 26 per cent in 2009. ZESCO's financial performance over the period 2004 to 2010 is shown in Table 3.2.

Financial indicator	2004	2005	2006	2007	2008	2009	2010
Net profit margin	6%	5%	6%	-18%	4%	3%	21%
Return on capital employed	3%	2%	2%	-10%	0%	7%	5%
Current ratio	1.26	1.14	1.07	0.97	0.82	0.93	1.01
Quick ratio	1.16	1.06	0.98	0.92	0.79	0.89	0.95
Interest cover	7.34	3.32	11.76	0.85	-0.41	10.69	8.61
Debt / equity ratio	58%	62%	65%	71%	74%	78%	53%
Gearing ratio	22%	25%	23%	31%	33%	35%	23%
Debtor days	172	189	168	176	147	136	89
Asset turnover	0.34	0.28	0.26	0.28	0.29	0.35	0.43
Source: ZESCO Financial Statem	ents. 2004–20	010					

Table 3.2: ZESCO financial performance indicators, 2004–2010

The indicators for 2010 seem to suggest that ZESCO may be turning around its poor financial performance. The net profit margin increased seven-fold from 2009 influenced by the increase in tariff. Interest cover, at 8.61 (times), makes it ever more possible for the utility to procure additional loans for its expansion programme. Also important is that debtor days have trended downwards since 2004. There has also been a reduction in distribution losses, which were 25.2 per cent³³ in 2007 and stood at 18.6 per cent³⁴ at the end of the 2009/2010 financial year.

CEC's performance

CEC is ZESCO's single largest customer. As Figure 3.6 shows, in the early 1980s CEC purchased approximately 70 per cent of ZESCO's generation output. Over the years this proportion has declined, but in 2009, sales to CEC accounted for 36 per cent of total generation, still a significant figure. This reduction has come about due to growth in other areas of the economy, but also because ZESCO is directly supplying mining operations that have started up outside of the Copperbelt area that is supplied by CEC.



Figure 3.6 CEC purchases and total system consumption in Zambia, 1982–2009

CEC's performance over the period 2005 to 2009 is shown in Table 3.3. It is difficult to make comparisons of its performance with that of ZESCO, however, since it supplies electricity to a niche market of mining houses that are small in number and consume electricity in bulk.

Table 3.3 ·	CEC's	financial	nerformance	2005-2009
<i>Tuble</i> 5.5.	CLC S	jinanciai	perjormance,	2003-2007

	2005	2006	2007	2008	2009
Sales (\$ '000)	122 164	127 280	131 746	177 486	154 169
Gross profit (\$ '000)	36 367	37 383	38 746	49 526	42 371
Profit before interest and taxes (\$ '000)	15 240	12 745	13 306	17 222	19 126
Acid Test Ratio	0.74	0.67	1.24	1.26	0.95
Return on Equity	12%	12%	16%	26%	8%
EBITDA (\$ '000)	24 202	21 293	22 152	26 419	28 682
Total Assets (\$ '000)	136 505	131 453	150 745	178 977	274 711
Earnings per share (USc)	0.82	0.79	0.73	1.01	1.19
Return on assets	6.0%	6.0%	4.6%	5.7%	4.4%
Net profit (\$ '000)	8 241	7 915	7 251	10 143	11 920
Equity (\$ '000)	68 021	65 680	45 630	39 573	158 273
Current assets (\$ '000)	19 746	17 395	35 151	53 579	36 500
Inventory (\$ '000)	1 028	1 136	1 307	3 443	3 506
Current liabilities (\$ '000)	25 206	24 332	26 149	39 786	34 847

Source: CEC Annual Reports

Regulatory governance

As mentioned above, the passing of the Energy Regulation Act in 1995 paved the way for the establishment of the Energy Regulation Board (ERB). The ERB regulates both the electricity sector (including renewables) and the petroleum sector in an arrangement similar to that of the Energy Regulatory Commission (ERC) in Kenya. For the purposes of this chapter however, we will focus on the work it carries out in relation to electricity regulation.

The ERB's powers and responsibilities are set out in the Energy Regulation Act and the Electricity Act, both of which were passed in 1995. Both Acts were amended in 2003, and in 2009, the ERB was drafting revised Energy Regulation and Electricity Acts. Thus, this section refers to the 1995 Acts, the 2003 Amendments and the 2009 draft legislation.

The powers and functions of the ERB

The laws on which regulatory governance is founded should give the requisite powers to the regulator to enable it to carry out its core functions. As we stress throughout this volume, the core functions of regulators are:

- facilitating market access through licensing;
- setting tariffs in an objective manner that is devoid of political influences;
- setting and monitoring technical standards for the industry that promote quality and reliability service provision;
- resolving consumer complaints and adjudicating disputes among players in the sector; and
- taking into account the special interests of low-income consumers and facilitating new connections. This is particularly important for developing countries where access to electricity low.

In comparison with international best practice (see Brown et al., 2006), Zambia's legislation generally provides the ERB with sufficient powers to carry out its functions. There are however four areas where the ERB's authority could be further clarified and enhanced, namely: tariff setting, power-purchase agreements, subsidiary policy and rule making, and its authority to carry out administrative functions. The problematic issues relating to these four areas are briefly outlined below.

Tariff setting

The ERB determines all retail electricity tariffs in Zambia and its decision on these is final. However, this key responsibility of the regulatory authority is not specifically stated in the primary legislation, and the ERB relies on the interpretation certain clauses in the of the and Clauses 8(2) to 8(4)(a) of the Electricity Act in order to set retail tariffs. Clause 6(1)(c) of the Energy Regulation Act states that the ERB should:

receive and investigate complaints from consumers on price adjustments by any undertaking, and regulate such adjustments by the attachment of appropriate conditions to licenses held by undertakings or by such other means as the Board considers appropriate.

Clause 8 in the Electricity Act reads as follows:

- (2) If an operator considers it expedient to vary or alter charges in respect of any supply of electricity, the operator shall give notice to the consumer of the proposal to vary or alter those charges, as the case may be.
- (3) If the consumer does not make any application under subsection (4) within thirty days of the date of notice referred to in subsection (2), the variation or alteration, as the case may be, shall, unless the operator of the undertaking and the consumer otherwise agree, come into effect thirty days after the date of that notice or from such later date as the operator may in that notice fix.
- (4) The Board shall, on an application by a consumer, review a proposal referred to in subsection (2), taking into consideration any submissions made by the consumer.
 (a) The Board may, if it considers it appropriate, on its own motion review a notice by an operator of an undertaking to vary or alter charges in respect of any supply of electricity.

Clause 6 of the draft Energy Regulation Act of 2009 provides greater clarity and states that the ERB shall:

(1) (c) Receive, investigate and determine complaints from consumers on prices and quality of services provided by any licensed enterprise and regulate such prices and quality of services as provided under this Act or any other written law...
 (1) Regulate prices, charges and tariffs in the energy sector.

In addition, the proposed new legislation contains 'The Electricity (Determination of Electricity Tariffs) Regulations' which clearly detail how tariff applications should be made and the process that the ERB should follow in their considerations, including the maximum length of time it should take and the key principles and methodologies that should be used.

Power purchase agreements

Regulatory oversight of power purchase agreements is an important function given the influence that these agreements have on end-user prices, and the adequacy and availability of electricity. In Zambia, this is even more important as over half of ZESCO's capacity is contracted through a single power purchase agreement. Existing legislation makes no specific reference to power purchase agreements or to the ERB's role in their approval. In practice however, the ERB has to certify that it has 'no-objection' to the inal initialled drafts of power purchase agreements based on the conditions attached to the licenses that it issues.

Subsidiary policy and rule making

Contrary to the cases of Uganda and Tanzania, Zambia's legislation does not grant the ERB the authority to craft subsidiary legislation such as statutory instruments. However, Clause 27.(1) of the Energy Regulation Act states that:

The Minister may, by statutory instrument, make regulations for or with respect to any matter that by this Act is required or permitted to be prescribed, or that is necessary or expedient to be prescribed for carrying out or giving effect to this Act.

The ERB may therefore make representations to the Minister of Energy and Water Development regarding proposals for regulations that should be issued. In practice however, there tend to be delays in this process. This provision remains in the proposed legislation, but with the inclusion of Clause 48, which states:

The Board shall issue and publish in the Gazette such guidelines, bulletins or other regulatory statements as the Board may consider necessary or desirable for the administration or execution of this Act.

In Zambia, the making of subsidiary legislation has traditionally been the responsibility of the respective minister and, in general, such power has never devolved to statutory institutions.³⁵

The authority to carry out administrative functions

The ERB has the authority to carry out the general administrative functions that are required of any body corporate, such as the preparation and approval of budgets and the determination of organisational structure and the hiring of staff. Even so, through the following three clauses of the Energy Regulation Act, it is the minster who gives final approval:

- 3 A(2) The terms and conditions of service of the Executive Director³⁶ shall be determined by the Board with the approval of the Minister.
- 4 (1) There shall be a Secretary to the Board who shall be appointed on such terms and conditions as the Board may, with the approval of the Minister determine.
- 4 (3) The Board may appoint, on such terms and conditions as it may, with the approval of the Minister, determine, such other staff as it considers it necessary for the performance of its functions under this Act.

This goes against the principles of regulatory independence. The proposed new legislation seek to remedy this situation.

The adjudication of disputes

The ERB adjudicates disputes based on the interpretation of Clause 6(1)(d) of the Energy Regulation Act:

Receive or investigate complaints from consumers and licensed undertakings on services provided by the undertaking and regulate such services by the attachment of appropriate conditions to the licences held by undertakings or by such other means as the Board considers appropriate.

It was recognised that this was an area that required greater clarity and the proposed legislation was expected to enhance the powers of the ERB in the mediation of disputes, and to provide greater clarity and certainty to the industry. But as at 2010, there had been no progress in converting these proposals into law. What appears to be an excellent initiative to further the development of the Zambian power sector is therefore at risk of not being implemented.

Regulatory independence

For regulators to be independent, it is widely accepted that the law should provide clarity on the manner in which those charged with the responsibility of making regulatory decisions are appointed. The law should also provide regulators with security of tenure even in the face of difficult or sensitive decisions. Regulators should also have guaranteed sources of funding preferably outside of the government fiscal regime, as well as the authority to apply such funds as they deem fit in carrying out their duties. And like any other corporate body, regulators should have the freedom to make administrative decisions.

The board

In 1996, five of the seven board members that Act provided for were appointed. Three of these were full-time appointments, and the energy ministry appointed the chairperson in accordance with the law at the time.³⁷ The ERB became operational in 1996, albeit with a skeleton staff. While in similar

regulatory institutions, such as in Tanzania for example, the Executive Director (CEO) is also a member of the Board. This is not the case in Zamiba where Executive Director is an ex-officio member of the Board who 'may' attend its meetings.

The 2003 ammendment to the Act provides for the Board to elect the chairperson and vicechairperson from among its members. Bearing in mind that this would be the very first business of any new Board, it seems likely that the members would not know each other sufficiently to gauge experience and qualifications to the extent required to make an informed decision. Such a decision might therefore be better made by the minister, who would be privy to the information used in the appointment of the board members.

According to the 1995 Energy Regulation Act, the Board of the ERB should comprise seven part-time members appointed for a term of three years by the Minister of Energy and Water Development. This term is renewable once. Board members should be eminent persons with adequate knowledge, experience and qualifications the fields of engineering, finance, law, natural-resource management, the electricity or petroleum industries, or the administration of these.

The 1995 Energy Regulation Act makes no provision for staggered terms of office for Board members. This practice is useful for purposes of continuity and regulatory policy stability. The draft legislation does provide for this however. The proposed legislation also seeks to increase the length of tenure from three to five years on account of the length of time it takes board members to become fully *au fait* with of regulatory processes.

The Clause 6 of the same Act states that no person may be appointed to the Board who:

- (a) is an undischarged bankrupt;
- (b) has been convicted of an offence involving fraud or dishonesty;
- (c) has been convicted of an offence under this Act or any other written law and sentenced to a term of imprisonment of not less than six months, without the option of a fine;
- (d) is an office bearer or employee of any political party; or
- (e) is the holder of a licence or has any interest in a licence or in a partnership or corporation that is a holder of a licence.

The 1995 Act also provides the following grounds on which membership of the board may be terminated:

- (a) If the member is absent without reasonable excuse from three consecutive meetings of the Board of which the member has had notice;
- (b) If the member acquires a licence in the energy sector;
- (c) If the member becomes mentally or physically incapable of performing the duties of a member of the Board or;
- (d) If the member is declared bankrupt.

In spite of these provisions, the energy minister has on at least two occasions dissolved the Board before members had reached their three-year tenure limit, for reasons that don't seem to have anything to do with those provided for in the Act. Legally this was made possible by Clause 26 of the Interpretation and General Provisions Act of 1994 that states:

26. Where, by any written law, a power to make any appointment is conferred, the authority having the power to make the appointment shall also have the power (subject to any limitations or qualifications which affect the power of appointment) to remove, suspend reappoint or reinstate any person appointed in the exercise of the power.

However, the fact that the minister removed members from the Board for unspecified reasons does call into question the government's commitment regulatory certainty. While, the minister in reference to the board has remarked that he 'would want them to be as independent as possible',³⁸ several industry stakeholders have stated that they do not see the ERB as independent but rather as beholden to government.³⁹

Financial independence

The Energy Regulation Act states that the ERB can be funded by Parliamentary allocations, grants and donations, and through funds that vest in and accrue to the Board as a result of its work. By far the largest proportion of ERB funding is derived from 'funds that vest in and accrue to the Board' by means of licence and application fees.

Licence application fees are calculated at 0.1 per cent of the start up costs (in the case of a new venture), 0.1 per cent of most recent annual turnover (in the case of the renewal of a licence) or a minimum of ZMK1 million (US\$267.00).⁴⁰ Annual licence fees on the other hand were as of 2010 calculated at 0.7 per cent of the actual annual turnover of the licensed business, and the law provides for the possibility of this figure being increased up to a maximum of 0.8 per cent. Of the total amount collected by the ERB for licence and application fees, 20 cent is due to the government and 80 per cent is retained. In order to safeguard the ERB's financial and administrative independence it is important that this practice receives the full backing of the law and the proposed legislation had taken this into account.

The licence and application fees as retained by the ERB over the period 1998 to 2007 are shown in Table 3.4. Over this period fees have averaged 79 per cent of the ERB's total income, and if the year 2000 when the government gave the ERB with an extraordinary waiver is excluded from the calculation, this figure rises to 86 per cent.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Operational										
income (US\$)	799 662	1 505 178	2 906 209	1 879 747	2 207 870	2 289 963	3 200 909	5 368 625	5 771 756	7 063 437
Fees (US\$)	639 775	1 127 372	1 790 973	1 659 984	1 674 663	2 003 746	2 881 036	4 522 553	5 553 711	6 629 140
Fees as % of										
income	80.0	74.9	61.6	88.3	75.8	87.5	90.0	84.2	96.2	93.9

Table 3.4: ERB Fees as a proportion of total operational income

Source: ERB's annual financial statements, 1889–2007

Notes: The currency conversions are based on the 12-month average calculated at the end of December of each year using Bank of Zambia statistics.

While such reliance on a single source of income could pose a risk to the ERB, this practice is not uncommon to regulatory institutions. In any case, the ERB's actual income was less than budgeted for in just three years during the period 1999 to 2007 (see Figure 3.7). This means that, by and large, the ERB has been adequately funded, which could be interpreted as a sign of government's commitment to the regulatory process.



Figure 3.7: The ERB's actual versus budgeted income, 1999–2007.

Source: ERB's annual financial statements, 1889–2007

It is important to note that because the ERB is a multi-sector regulator, its mandate extends to the petroleum, coal and renewable energy industries. However, the ERB does not distinguish between these industries in its annual financial reporting, and therefore the figures given in Table 3.4 and Figure 3.7 reflect consolidated amounts and include data from energy sector as a whole. Even so, the contribution of the coal and renewables to total income was negligible. In 2008, the petroleum industry's contribution was approximately 77 per cent and the remainder derived largely from the electricity industry.⁴¹

Although licence fees are ultimately paid for by consumers of energy-related services in Zambia, ERB fees are not indicated on consumer electricity bills. Ideally consumers, who actually finance the ERB, should know how much they are contributing to its operations. This seems likely make the ERB more accountable to the public, and since there are instances when licensed operators fail to remit fees on time, it would also give operators an added incentive to be more disciplined.

Administrative independence

The ERB's CEO (Executive Director) is appointed by the Board, which also approves the organisational structure of the institution, and the appointment of senior staff. In 2009, the ERB had a staff compliment of 61. This presents a sizeable workforce but it should be remembered that the ERB regulates the whole of the energy sector. Nevertheless, approximately 50 per cent of these positions were administrative, which raises the question of whether there might be scope for this balance to be shifted in favour of professional staff.

The Board also determines the terms and conditions of service of staff at the ERB. But with the passing of the 2003 amendment to the Energy Regulation Act, final approval became the preserve of the minister. The government has since issued an additional directive stating that the Cabinet Office should sanction conditions and terms of service.⁴² This has the potential of equating ERB conditions of service with those of government employees and could stifle the employment of suitable talent. Such an eventuality would be at variance with the very rationale of setting up an independent regulatory body.

Between 1997 and 2008 staff turnover averaged 5.8 per cent. This relatively low figure masks the fact that key skills have been lost, particularly in the area of economic regulation.⁴³ The main reason for staff attrition appears to be inadequate remuneration. Staff costs were the single highest expenditure item, consistent with other similar institutions, and over the period 1998 to 2007 ranged from 25 per cent to 57 per cent of total operational income as shown in Table 3.5.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Operational income										
(ÛS\$)	799 662	1 505 178	2 906 209	1 879 747	2 207 870	2 289 963	3 200 909	5 368 625	5 771 756	7 063 437
Staff costs (US\$)	197 331	644 438	864 240	917 896	918 619	946 911	1 348 299	1 888 986	3 303 046	3 042 300
Staff costs as % of										
income	25	43	30	49	42	41	42	35	57	43

Table 3.5: Staff costs as a proportion of total operational income

Source: ERB's annual financial statements, 1889–2007

Notes: The currency conversions are based on the 12-month average calculated at the end of December of each year using Bank of Zambia statistics. As the ERB is a multi-sectoral regulator, the staff complement has to deal with the energy sector as a whole, not just the electricity industry.

Accountability

The ERB is required to produce an annual report that includes audited accounts prepared by an auditor appointed by the Board with the concurrence of the minister within six months of its 31 December financial year end. Thereafter, the annual report is required be presented to parliament within 21 days of the start of the next sitting. The Auditor General also audits the operations of the ERB from time to time. Aside from these formal requirements, there is regular informal contact between the ERB's executive director, the energy minister and the permanent secretary at the energy ministry.

The ERB also appears before parliamentary committees on an ad hoc basis, to make representations on various matters affecting the energy sector. Such representation has included the ERB's views on the commercialisation of ZESCO, and on the performance of the electricity sector and the issue of electricity tariffs. However no parliamentary committee hes specifically reviewed the ERB's performance. Such reviews could enhance accountability and keep legislators, policy makers and the public at large better informed of the ERB's activities.

Furthermore, although various consultants have reviewed the ERB's systems in the past, by 2009 there had been no independent impact assessments or performance audits conducted in the ERB. These are useful tools that could further enhance the public accountability of the ERB; and given the ERB's autonomy with respect to budgeting, 'value for money' audits would help to reassure stakeholders that expenditure was being prudently managed.

Appeals

In the case that a party to an ERB decision is aggrieved, the Energy Regulation Act provides for an appeal to the high court. Clause 16 of the 1995 Act makes provision for this with respect specifically to decisions pertaining to licensing:

- (1) Any person who is aggrieved by the revocation of a licence, or by the Board's refusal to renew a licence, may appeal to the High Court within thirty days of receiving notification of the revocation of, or the Board's refusal to renew, a licence.
- (2) Due lodgement of an appeal shall stay any revocation against which the appeal is brought, pending the outcome of the appeal, and in the case of a refusal of renewal, the licence if expired shall be deemed to have been renewed on the same terms and conditions pending that outcome.

In determining such an appeal, the high court undertakes a judicial review of the process used to arrive at the initial decision and does not decide on the substantive matter. The high Court can therefore request only that the ERB reconsider the decision on grounds of not having fully followed due process.

The above provisions do not preclude aggrieved parties from seeking a judicial review on the basis of natural justice on all other matters dealt with by the ERB, such as tariffs and standards, etc. By 2009, the ERB had never been taken to court on such grounds.⁴⁴ in the past, the ERB has accommodated informal appeals even on decisions that related to tariff levels, but this practice has been discontinued. In response, industry representatives have bemoaned the lack of a formal process through which they can appeal specifically against tariff decisions.⁴⁵

Transparency

Major decisions of the ERB are published in the newspapers and on its website (www.erb.org.zm). It is not easy, however, to find documentation that details the procedure used in responding to licence applications, determining tariffs or and summaries of decisions made at ERB meetings. These could be useful additions to the website. Such public disclosure could counter the view held by some stakeholders that the ERB's decisions are 'generally unpredictable'.⁴⁶

The ERB holds public hearings in the case of tariff applications where objections are heard and the respective utility is afforded an opportunity to make its case and respond to the objectors. Some stakeholders view these public hearings as public-relations exercises, however and indicated that they believe that views presented are not really taken in to account, and that decisions are made prior to the hearings. Other stakeholders believe that the ERB does not engage with them sufficiently on tariffs and other matters.⁴⁷ The ERB has subsequently endeavoured to make hearings more meaningful by summarising tariff requests and posing specific questions to the public for comment. This was applied in the case of ZESCO's tariff requests for 2008 and 2009.

For general information dissemination purposes, the ERB also held public meetings across the country from time to time. And when this research was being done in 2009, the board was considering opening up licensing-related meetings to the public

Ethics

The ERB Board and staff subscribe to a code of ethics that prohibits the acceptance of gifts with a value in excess of US\$200, the use of confidential information for personal advantage, selfenrichment through the use of one's position at the ERB, and the use of one's position to gain employment for others. The code is consistent with international best practice and is an important element of regulatory accountability and transparency.

Regulatory substance

We now delve into the area of regulatory substance: what the ERB actually does. Our focus is on licensing and market access (a crucial function if Zambia is to overcome the challenges of generation capacity), as well as tariff setting (upon which the current and future sustainability of the sector is premised). Also covered are technical quality and reliability standards, and pro-poor regulation.

Market access and licensing

Any entity that seeks to carry out entrepreneurial activity in the Zambian power sector has to be licensed by the ERB. In this respect the ERB issues four licences namely: generation (>100kW); transmission; distribution; and supply. The generation and transmission licenses are valid for 30 years, while those for distribution and supply are for 15 and 5 years respectively.⁴⁸ Given the likelihood of additional players entering the sector, the licensing of an independent system-operator and a power-market operator would help to ensure a level playing field across the sector. ERB's licensing process is outlines in Figure 3.8. In essence, applicants for new licenses are subjected to a financial, economic and technical assessment based on their business case, while for renewals, the same type of assessment is carried out based on past performance.

Licences are issued subject to certain conditions, and in the event that a licensee defaults on any of these, the ERB undertakes to follow the actions showed in its enforcement pyramid (Figure 3.9) the ultimate action of which is licence revocation.

The ERB however does not have the authority to revoke a licence. This power is vested in the minister who can do so only based on a recommendation from the ERB. The circumstances, as provided by the legislation, under which a licence may be revoked, are:

- repeated contravention of the provisions of the Energy Regulation Act;
- contravention of a condition in the licence that is expressed to lead to suspension or revocation.
- being the subject of such complaints by the public as in the opinion of the Board warrants revocation.

By 2010, the ERB had not revoked any licences in the electricity sector.





Figure 3.9: A summary of the ERB's licence revocation process



Power-sector planning and the procurement of new capacity

Planning is crucial for ensuring orderly market entry and the adequacy and reliability of power supplies. In hybrid power markets such as Zambia's, where there is a dominant, vertically integrated state-owned utility and private companies that operate on the margins of the sector, the issue of who exactly is responsible for planning can easily become nebulous. Furthermore, it is crucial that those responsible for planning work closely with those responsible for procurement processes, so that the planning of new capacity is co-ordinated with the initiation of new bids.

In Zambia, the energy ministry is responsible for planning, a function that had previously been performed by ZESCO. The procurement of new generation (and transmission) capacity is managed by the Office for the Promotion of Private Power Investment (OPPPI). In 2009 the ministry finalised its Power System Development Master Plan (Chubu Electric Power Company, 2009). This was the first plan since a 1998 ZESCO master plan that had since hardly been revised – a clear indication of how easily the planning function can end up be neglected in hybrid power markets. The 2009 plan will have to be regularly updated and there might be some benefit in a committee of stakeholders (including government, ERB, ZESCO and private operators) being established to oversee this. Such a committee could also draw on the planning capabilities that exist in ZESCO and CEC. Alternatively, if significant capacity constraints are identified within the ministry, the ERB could specify the planning function in, for example, the yet to be issued system operator licence. Interestingly, however, the ERB's generic transmission licence contains the following:

The Licensee shall be obligated to perform long term planning for the development of the integrated generation and transmission system. Such plans, in the form of an Annual System Opportunity Statement as prescribed by the ERB, shall be developed in accordance with the Grid Code and any other relevant codes, rules and standards prescribed or approved by the ERB. Such plans should be of assistance to potential power system developers and authorised electricity operators in identifying areas for system development and augmentation.

The Licensee shall produce such plans on a regular basis but not less than bi-annually. The plans shall be reviewed with the ERB and published for comments from other Licensees and interested parties. Final plans shall be made publicly available.

The forward time horizon for such plans shall be no less than 15 years.

By 2009, neither ZESCO nor CEC, the two companies with transmission licences, were producing Annual Opportunity Statements (in effect system plans) with any regularity.⁴⁹

With regard to procurement of new generation capacity, there is no policy that articulates the allocation of new build opportunities between ZESCO and the private sector. Also, the OPPPI that ostensibly runs bid processes is under resourced – in 2009, it employed only two professional staff and its lack of a legal mandate could hinder its operations and pose a threat to the timely and efficient procurement of new capacity. In 2010, OPPPI was spearheading government's project preparation and negotiations for the Kafue Gorge Lower, Kalungwishi and Kabompo Gorge projects. Table 3.6 lists generation projects in the pipeline for Zambia as of 2010.

Project	Capacity	Cost	Developer	Funding highlights
	(MW)	(US\$	I	
		'millions)		
Kafue Gorge Lower	600-750	1 500	Joint venture between ZESCO	Export credit
(Hydro)			(35%) and the China-Africa	(\$1 billion) plus other
			Development Fund with Sino-	
			Hydro (65%)	
Kariba North Bank	360	420	Wholly owned ZESCO subsidiary	China Exim bank (\$360
Extension			Sino Hydro as EPC	million) plus
(Hydro)				Development Bank of
				Southern Africa
Itezhi-Tezh	120	230	Joint venture between ZESCO	Concessional loan from
(Hydro)			(50%) and Tata (50%)	Indian government plus
				others
Maamba	300	420	Nava Bharat	Financing proposals
(Coal)				under discussion
Kabompo Gorge	40	140	CEC	Financing proposals
(Hydro)				under discussion
Kalungwishi	220	800	Lunzua Power Authority	Financing proposals
(Hydro)				under discussion

Table 3.6: Generation projects in the pipeline, Zambia, 2010

Sources: CEC, ZESCO and OPPPI, personal communication, 2010.

Table 3.6 also reveals China and India's increasing influence on Zambia's power market. These Chinese-supported projects, financed primarily through export-credit arrangements, are providing an alternative to traditional project financing. Though not competitively bid, what appears to be attractive to government is the swiftness with with project preparation is done and financial closure is reached, thus increasing the likelihood of quick start to construction. For example, in 2007, the Zambian government retained World Bank affiliate, International Finance Corporation (IFC), as advisors on the Kafue Gorge Lower project.⁵⁰ IFC recommended an international competitive bidding process through which it would have taken 36 months to reach financial closure after all feasibility studies had been concluded. In 2010, at the end of IFC's contract for advisory services the government announced that it had entered into an agreement with the China-Africa Development Fund, the China Development Bank and the Sino-Hydro Power Company for the development of Kafue Gorge Lower. At the time of writing, geotechnical feasibility studies were being undertaken but, in stark contrast to the IFC process, financial closure is scheduled for mid 2011, and construction is expected to start soon thereafter.⁵¹

As at 2010, none of the projects listed in Table 3.6 had been licensed by the ERB. Nonetheless, given the size of most of these projects, and their potential impact on pricing as well as the adequacy and reliability of generation, it would be prudent for the ERB to develop mechanisms through which it can be kept abreast of developments. As we have stressed in other chapters, and as evidenced in Uganda's Bujagali project, the presence of regulators in an observer capacity during PPA negotiations can aid in clarifying potential stumbling blocks and understanding context even before initialled agreements are sent through the regulatory 'no-objection' process. Nonetheless such observer status should not imply that the regulator has ceded their right to approve the PPA.

Tariffs

The ERB uses the revenue-requirement method to determine tariffs,⁵² and this is embedded in the cost-of-service model depicted in Figure 3.10.

Figure 3.10: ERB's cost of service model, Zambia 2007



Source: http://www.erb.org.zm/downloads/CostOfServiceStudyReport.pdf

In theory, the revenue-requirement method allows for full cost recovery but, by 2010, this was yet to be achieved. As mentioned above, Zambia's electricity tariffs have been among the lowest in the world and this has been a significant challenge for the goal of cost recovery. The government's aim is to reach cost reflective tariffs by 2011.⁵³ The ERB has projected that the cost-reflective tariff for residential consumers in 2011 will be approximately US¢6.57/kWh in 2011 as shown in Table 3.7.

Customer category	2008	2009	2010	2011
Residential				
% change	26.8%	16.6%	11.9%	5.0%
Unit price (US¢/kWh)	4.79	5.59	6.25	6.57
Commercial				
% change	1.3%	0.3%	0.3%	4.4%
Unit price (US¢/kWh)	5.14	5.16	5.18	5.40
Services				
% change	6.8%	1.9%	1.9%	7.0%
Unit price (US¢/kWh)	3.89	3.97	4.05	4.33
Small power				
% change	16.2%	5.5%	4.5%	5.7%
Unit price (US¢/kWh)	3.26	3.44	3.59	3.80
Large power				
% change	27.5%	16.6%	2.2%	6.3%
Unit price (US¢/kWh)	2.76	3.22	3.29	3.50

Table 3.7: The ERB's projected path to cost reflective tariffs by 2010, Zambia

Source: ERB, personal communication, 2010

Reaching the proposed levels could prove elusive however. Table 3.8 shows ZESCO's tariff yield (average tariff) over the period 2006 to 2010. Although tariffs have increased by almost 90 per cent in Zambian Kwacha since 2006, exchange-rate fluctuations mean that the equivalent increase in US-dollar terms has only been 66 per cent. Of concern to policy makers is the fact that at $US \notin /kWh3.40$ tariffs in Zambia are still low in comparison with other the countries, including those covered in this volume.

	2006	2007	2008	2009	2010
Revenue (US\$ million)	172.3	241.1	235.5	346.5	327.2
Energy consumed (GWh)	8 421	9 014	9 440	9 631	9 619
Tariff yield (US¢/kWh)	2.05	2.68	2.49	3.60	3.40

Table 3.8: ZESCO's tariff yield (average tariff), 2006–2010

Asset valuation

An important factor in the revenue-requirement determination is the method used to determine asset values as this influences the return earned on assets and depreciation expenses. There has been some debate within the ERB as to whether the valuation should be based on historical or replacement values. The two approaches would likely yield widely differing tariff outcomes. With regard to depreciation in particular, valuations based on historical costs would not enable ZESCO build up the reserves required to replace plants when required, and would mean significant tariff increases to support plant refurbishments. The ERB also needs to adopt an internationally recognised means for the valuation of the country's old hydropower assets.

Containment of ZESCO costs

The need to increase tariffs to cost reflective levels presents a dilemma for the ERB in that while there was a legitimate need for increases, there was also need for strong guarantees that the extra revenue generated by ZESCO would not lead to wasteful expenditure. Any tariff award to ZESCO would therefore have to be accompanied by additional robust oversight as well as incentives and sanctions to ensure prudency. In this regard, the ERB has developed a set of key performance indicators (KPIs) shown in Table 3.8, against which ZESCO's performance is being measured. As the time of writing, the KPIs did not impact tariff awards to ZESCO, but from 2011 it is planned that tariff adjustments will be related to performance against the KPIs.⁵⁴

Performance indicator	Target measures
Metering of consumers	All new consumers are metered upon connection All new residential connections to be completed within 30 days following a consumers payment for connection All un-metered consumers are metered by March 2010 (i.e. 1/3 of the December 2007 backlog is metered every year until 2010).
Cash management	All consumers are billed on a timely and regular basis by December 2007 Reduce debtor days to not more than 60 days by March 2010 Total trade receivables do not exceed 17% of turnover by March 2010 Total receivables do not exceed 17% of total income by March 2010
Staff productivity	Increase number of consumers per employee to 100 by March 2010 Reduce staff costs from 49% to 30% by 2010
Quality of service	Reduce annual unplanned outages to five hours per consumer by March 2010
System losses	Maintain system losses at 3% or less Reduce distribution losses to 14% by March 2010

Table 3.8: Key performance indicators for ZESCO

Power purchase agreements

The relationship between ZESCO and CEC is governed by a bulk-supply agreement (BSA), a power purchase agreement that is due to lapse in 2020. Given that CEC is ZESCO's principal customer, this agreement is by far the most important PPA in Zambia's power sector. The ERB has no regulatory oversight of the BSA, however, as it was signed before the regulator became operational. While applying regulatory policies in retrospect is at variance with best practice, and raises pertinent

regulatory commitment and certainty issues, the significant degree to which the BSA contract has the potential to distort the Zambian power market is sufficient reason to seek means by which the ERB's regulatory oversight could extend to it. In any case, it has been widely recognised that pricing in the BSA was not favourable to ZESCO and that this led to the 2008 upward revision in the tariff to CEC. It is possible that there will be further revisions to the agreement before it expires, and in that event, the ERB should play a more active role.

Notwithstanding the challenge that arises from the BSA, conditions in the generic transmission and generation licences provided ample scope for the regulatory oversight of PPAs in general. The following clauses are common to both licences:

- 18.1 The Licensee shall provide for the ERB's prior review of all contracts and agreements:(a) With other licensees or with retail or wholesale customers;
 - (b) For the import or export of power or energy;

(c) For the transmission or the purchase or sale of bulk power or energy, including any and all contracts or agreements for the purchase or sale of electricity being entered into for the purposes of enabling or securing financing for new or expanded capacity.

- 18.2 Any such contracts or agreements concluded without the ERB's prior approval of their pricing provisions shall be considered null and void for the purposes of the ERB's determination of tariffs.
- 18.3 The ERB has the right to retain copies of such contracts and agreements.

In addition, the following conditions are specific to the generation licences:

- 4.1 The Licensee shall enter into electricity sales contracts in accordance with the Grid Code. All electricity sales contracts, including those for the export market, shall be approved by the ERB.
- 4.2 The price at which generated electricity may be sold shall be determined in accordance with procedures prescribed by the ERB, and actual tariffs shall be subject to prior approval by the ERB.
- 4.3 The Licensee shall comply with its obligations under its electricity sales contracts and shall, upon request, provide full information relating to its contractual obligations to the ERB.
- 4.4 The Licensee shall enter into an ancillary service agreement with the System Operator in accordance with the Grid Code.
- 4.5 The Licensee shall, if necessary, enter into a distribution use-of-system and connection charging agreement with the Distribution Licensee.

And the following conditions are specific to the transmission licences:

- 3.1 Before levying or quoting any tariffs, fees or charges for the provision of transmission use of system or connection services, the Licensee shall develop and submit to the ERB for approval within the first 30 days of each calendar year a methodology for determining fair and equitable transmission use of system fees and tariffs and connection charges, and a schedule of proposed fees, tariffs and charges for various standard connection designs.
- 3.2 The methodology shall appropriately reflect recovery of all reasonable and prudent material and labour costs, including an appropriate return on investment, necessary in operating the network or putting in place a connection, and shall also include guidance on how to apportion charges among multiple connections at a single off-take point.

Technical standards

The ERB uses standard ZS387 (developed by the Zambia Bureau of Standards) to regulate the quality and reliability of electricity in Zambia. The standard, based largely on the South African standard NRS048, was developed through a consultative process with various stakeholders spearheaded by the ERB. ZS387 contains quality levels that the ESI should adhere to in terms of frequency, voltage deviation, voltage harmonics, forced interruptions and planned interruptions.

Implementation and monitoring of these standards has proven difficult however and in 2010, the ERB was in the process of hiring a consultant to determine the base level at which the power system was operating in relation to these standards prior to developing a monitoring regime.

There is also a separate standard for consumer service, ZS397. Its development was also spearheaded by the ERB through a consultative process. Although the monitoring of performance against this standard has also been difficult,⁵⁵ the standard provides minimum levels for various consumer service parameters including:

- processing of requests for service
- meter reading
- location of pre-payment metering vending stations
- service faults
- notification of planned interruptions
- telephone response times
- treatment of consumer complaints
- street lighting

Pro-poor initiatives

Rural electrification

By 2009, only 3 per cent of the rural population in Zambia had access to electricity. With the strong link between access to electricity and poverty alleviation, the government is keen to rapidly expand electrification in rural areas. The Rural Electrification Authority (REA) was established in 2003, and has the ambitious target of increasing rural access to electricity to 51 per cent by 2030. If achieved, this would improve the overall electrification rate in the country from 23 per cent to 66 per cent. As would be expected, the funding required for this an electrification programme of this size are significant. Current estimates are that in order to reach the target a total of US\$1.1 billion will need to be spent at an annual rate of US\$50 million. The electrification programme is funded by a 3 per cent levy on all electricity bills, transfers from the government treasury and donor grants. The rural electrification challenge remains a formidable one with spending between 2006 and 2008 falling far short of target as shown in Table 3.9. This means that projected expenditure for 2009 was more than double the amount spent in the previous two years.

Currency	2006	2007	2008	2009 (projected)
Rural electrification spend (ZMK billion)	10.5	21.0	21.4	88.0
Rural electrification spend (US\$ million)	2.9	5.2	5.7	16.7
Rural electrification spend (US\$ million)	2.9	5.2	5.7	

Table 3.9: Spending on rural electrification projects, Zambia, 2006–2009

Source: REA, personal communication

Note: Exchange rates are based on annual Bank of Zambia averages and for 2009 the prevailing mid rate on 15 May 2009.

Pro-poor tariffs

ZESCO's increasing block tariff is structured as follows:

- R1: 0–100kWh
- R2: 101–400kWh
- R3: >401kWh

The first block, R1, also referred to as the lifeline tariff, is based on the rationale that 100kWh per month is required to meet the basic electricity requirements of a household. This amount is generous by international standards. Arguably, subsidised electricity should be provided only to those with insufficient means. However, the block tariff structure allows the basic subsidy to accrue to all residential consumers. Also, with access to electricity low and tariffs at below economic levels, it is somewhat of a contradiction to subsidise tariffs. Alternative and more sustainable poverty alleviation methods would be worth exploring.

Conclusion

The ERB faces considerable challenges. Most significant is that tariffs remain too low for economic sustainability. In the absence of direct equity injections from government, ZESCO will continue to struggle to raise funds for plant renewal and capacity expansions even in the light of the Chinese and Indian alternatives earmarked for specific projects. The ERB therefore has to devise means of making tariffs reach cost reflective levels without this being disruptive to the overall economy. A key element of this puzzle is the CEC bulk-supply agreement, which should be priced to ensure that the mining community pays their fair share for the burden they impose on Zambia's power system.

However, given the questions raised about ZESCO's levels of efficiency, there is a danger that increased tariffs may merely allow wasteful expenditure and might not necessarily result in improved investment in the quality and reliability of the services provided. ERB's increasing emphasis on measuring ZESCO's performance against agreed indicators provides scope for curtailing excess losses provided consequences are incorporated into this regime. Tariff increases will also require an effective communication strategy to ensure that the public are given an clear explanation of why tariffs are increasing.

With such an emphasis on tariffs, it is tempting to believe that tariff increases are the panacea for all of the sector's woes. Such a theory is disproved by the Tanzanian example, where tariffs are high but new investment remains difficult to attract. Tariffs must therefore be seen in the context of a package of regulatory measures.

An area where there seems to be scope for the ERB to be more active is in the procurement of new capacity. Mechanisms that keep the regulator abreast of developments should be developed as opposed to them being involved only in granting PPA approvals at the tail end of the process. For example, a system-adequacy standard could be included in the licence conditions for transmission (or system operation) against which the ERB could ensure that current and planned generation and import capacity is sufficient. In addition, the ERB, in conjunction with the OPPPI, could develop a set of guidelines for potential investors, outlining the licensing and PPA approval processes so that they understand the regulatory environment more clearly right from the start.

Zambian power sector is in an exciting phase of its development, and the continent's oldest regulator must be part of that excitement.

Notes

- 2 http://www.engineeringnews.co.za/article/uncertainty-looms-over-hydroelectric-project-eskomsinvolvement-2009-12-04
- 3 http://www.mewd.gov.zm/index.php?option=com_content&task=view&id=106&Itemid=142
- 4 ZESCO does own a fleet of stand-alone diesel-fired generators that supply remote rural areas, but as at 2010, their combined capacity of 7.3MW was a negligible fraction of total installed capacity. CEC also owns a sizeable 80MW of grid-connected diesel-fired generation units, but these are reserved for emergencies on account of mining requirements which necessitate that critical underground water-pumping stations and ventilation equipment is kept running if the main grid supply fails.
- 5 Kariba North Bank power station is fed by water from one of the largest reservoirs in the world, Lake Kariba, and Kafue Gorge, as well as Lake Itezhi-Tezhi.
- 6 For a full list of the SAPP countries, see http://www.sapp.co.zw.
- 7 ZESCO, personal communication, 2010.
- 8 http://africanhydrosymposium.org/pdf/2008/LHPC%20HYDRO%20SYMPOSIUM%20-%20MPS%20UPGRADE.pdf
- 9 The Victoria Falls Power Company was established in 1906 with the aim of meeting the electricity requirements of the Witwatersrand, the area that is famous as the source of most of South Africa's gold mines. In the year it began, the Victoria Falls Power Company bought out Rand Central Electric Works and the General Electric Power Company. In 1909, the company was renamed the Victoria Falls and Transvaal

¹ For a discussion of hybrid power markets, see Gratwick and Eberhard (2008).

Power Company, by which time the plan for drawing hydropower from Victoria Falls had been abandoned in favour of exploiting the coal reserves found in what was then the Transvaal. For more info, see http://www.eskom.co.za/live/content.php?Item_ID=495&Revision=en%2F0http://www.vaaltriangleinfo.co .za/ history/resources/electricity_1.htm

- 10 http://www.zesco.co.zm/index.php?option=com_content&task=view&id=13&Itemid=9
- 11 http://africanhydrosymposium.org/pdf/2008/LHPC%20HYDRO%20SYMPOSIUM%20-%20MPS%20UPGRADE.pdf
- 12 http://www.zesco.co.zm/index.php?option=com_content&task=view&id=13&Itemid=9
- 13 http://www.cecinvestor.com/milestones.aspx
- 14 http://www.cecinvestor.com/milestones.aspx
- 15 http://www.cecinvestor.com/milestones.aspx
- 16 The Federation of Rhodesia and Nyasaland, also known as Central African Federation (CAF), was a semiindependent state in southern Africa that existed from 1953 to the end of 1963, comprising the former selfgoverning colony of Southern Rhodesia and the British protectorates of Northern Rhodesia, and Nyasaland. Northern Rhodesia gained independence in 1964 and was renamed Zambia. Southern Rhodesia gained independence in 1980 and was renamed Zimbabwe.
- 17 http://www.zesco.co.zm/index.php?option=com_content&task=view&id=13&Itemid=9
- 18 http://www.zesco.co.zm/index.php?option=com_content&task=view&id=13&Itemid=9
- 19 The Higher Power Authority comprised two ministers from each country.
- 20 ZESCO, personal communication, 2009.
- 21 ZCCM was the result of the merger of Nchanga Consolidated Copper Mines and Roan Consolidated Mines, companies that were formed in 1969 when the copper industry was nationalised. ZCCM's major shareholders were the Zambian government (60.3 %) and the Anglo American Corporation (27.3%) (http://www.cecinvestor.com/milestones.aspx)
- 22 http://www.zaraho.org.zm/history.html
- 23 In the mid 1980s Zimbabwe imported up to 40 per cent of its requirements from Zambia (Energy Sector Management Assistance Programme 1988).
- 24 CEC's emergency generation facilities are not included in this count, nor are remote rural stand-alone schemes such as the 700kW Zengamina project in the North Western Province.
- 25 Distribution losses in 1988 were at an internationally acceptable level of 10.1 per cent, but by 1995 they had risen to 28.4 per cent (World Bank, 2006).
- 26 The HIPC initiative was a programme of the IMF and World Bank designed for debt to be brought down to sustainable levels in developing countries that had high levels of poverty
- 27 Government had earlier committed to the privatisation of ZESCO but increasing public dissatisfaction with the divestiture programme was beginning to make its political viability questionable.
- 28 http://www.narucpartnerships.org/Documents/Zambian%20Power%20Market.pdf
- 29 'World Bank Colonialism,' *The Post,* 2 December 2002. Available at: http://allafrica.com/stories/200212020222.html
- 30 Admittedly, ZESCO managers were themselves not in support of privatisation or unbundling, and given their access to political principals may have helped shape the change of policy that ultimately occurred.
- 31 Some World Bank officials criticised the lack of objective measurables against which the commercialisation process could be gauged (World Bank, personal communication, 2007)
- 32 C Mfula and S Shacinda. 'Zambia Copper Mines Suspend Output After Blackout.' *Africa Report*, 18 June 2010. Available at http://www.theafricareport.com/last-business-news/.
- 33 ZESCO Financial Statement, 2008
- 34 ZESCO, personal communication, 2010.
- 35 ERB official, personal communication, 2009.
- 36 The Executive Director is the equivalent of a CEO.
- 37 The 1995 Energy Regulation Act provided for the appointment of three full-time members with experience and qualifications in electricity, petroleum and renewable respectively, and four part-time members from whom the energy minister would appoint a chairperson. Only five members were ever appointed to the ERB's first board. At the end of their first term none of these appointments were renewed, and a new board consisting of three part-time members was appointed in 2001.

- 38 Kenneth Konga, Minister of Energy and Water Development, personal communication, 2009.
- 39 Members of industry associations, personal communications, 2009.
- 40 Based on the Bank of Zambia's average exchange rate for 2008.
- 41 ERB, personal communication, 2009.
- 42 The Cabinet Office serves as the secretariat to Zambia's Cabinet.
- 43 ERB, personal communication, 2009.
- 44 ERB, personal communication, 2009.
- 45 Personal communications, 2009.
- 46 Personal communications, 2009.
- 47 Personal communications, 2009.
- 48 Distribution and supply licenses are valid for a shorter times so that the licenses do not become a hindrance in the event of industry restructuring.
- 49 ZESCO, personal communication, 2009.
- 50 Personal communication, 2010.
- 51 'State, Chinese Team Up to Develop Kafue Gorge,' *Times of Zambia*, 14 August 2010. Available at: http://allafrica.com/stories/201008160637.html; OPPPI personal communication, 2010.
- 52 Where RR = revenue requirement, RAB = regulatory asset base, RoR = rate of return, E = operations and maintenance expenses, D = depreciation, T = taxes.
- 53 ERB, personal communication, 2010.
- 54 ERB, personal communication, 2010.
- 55 ERB, personal communication, 2010.

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