



MISSION STATEMENT

To regulate the Energy Sector in a transparent, effective and efficient manner that safeguards the interests of all stakeholders

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ENERGY SECTOR REPORT

2007

FOREWORD

The Energy Regulation Board (ERB) presents the second publication of the Energy Sector Report. This report reviews the performance of the sector in 2007 and provides an outlook of the energy industry. Most of the information presented is collected from the regulated entities and other Government agencies.

The energy sector continues to experience various challenges; key among these are the electricity power deficit and unprecedented high and volatile oil prices, coupled with the lack of national strategic petroleum reserves to guarantee security of supply. These challenges pose a serious threat to economic growth, which is heavily dependent on energy services and products.

It is clear that without concerted efforts to address these challenges, Zambia's economic growth will be compromised. It is therefore imperative that strategic decisions are made to address these challenges in the energy sector.

Possible solutions include additional investment in existing energy infrastructure, the consideration of alternative sources of energy such as bio-fuels, development of off-grid mini hydro projects and enhanced use of solar energy, among other initiatives.

The ERB hopes that the annual sector reports are useful and provide relevant information on the performance of the energy sector. The ERB eagerly welcomes your valuable comments to enable us improve on the scope and quality of future reports. For more information on other publications by the ERB, kindly visit our website: www.erb.org.zm or call at our offices in Lusaka and Kitwe.

A handwritten signature in black ink, appearing to read 'Silvester Hibajene', is written over a thin horizontal line.

Silvester Hibajene
EXECUTIVE DIRECTOR



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ABBREVIATIONS

Bbl	-	Barrels
BUTT	-	Bulk User Transmission Tariff
CEC	-	Copperbelt Energy Corporation
CIDZ	-	Chambishi Industrial Development Zone
CNMC	-	China Non-Ferrous Metals Group Corporation
CoS	-	Cost of Service
DAM	-	Day Ahead Market
ERB	-	Energy Regulation Board
GDP	-	Gross Domestic Product
GWh	-	Giga-watt hour (1,000,MWh)
HFO	-	Heavy Fuel Oil
IFC	-	International Finance Corporation
KFG	-	Kafue Gorge
km	-	kilo metre
KNB	-	Kariba North Bank
kV	-	Kilo Volt (1,000 volts)
kVA	-	kilo Volt amperes (1,000 amps)
Kw	-	Kilo Watt
KWh	-	Kilo Watt Hour (1,000wh)
IPG	-	Independent Petroleum Group
IPP	-	Import Parity Pricing
IPP	-	Independent Power Producer
ITC	-	Independent Transmission Companies
LHPC	-	Lunsemfwa Hydro Power Company
LFO	-	Light Fuel Oil
LPG	-	Liquefied Petroleum Gas
MD	-	Maximum Demand
MEWD	-	Ministry of Energy and Water Development
MoFNP	-	Ministry of Finance and National Planning
MT	-	Metric Tonne
MVA	-	Mega Volt Amperes
MW	-	Mega Watts
MWh	-	Mega watt hour (1000Kwh)
MYT	-	Multi Year Tariff
M ³	-	Cubic Metre (1,000 litres)
NFT	-	Ndola Fuel Termina
OMC	-	Oil Marketing Company
OPEC	-	Oil Producing and Exporting Countries
PRP	-	Power Rehabilitation Project
REA	-	Rural Electrification Authority
RERA	-	Regional Electricity Regulators Association
SADC	-	Southern African Development Community
SAPP	-	Southern African Power Pool
STEM	-	Short Term Energy Market
ToU	-	Time of Use
ZCCM	-	Zambia Consolidated Copper Mines
ZESA	-	Zimbabwe Electricity Supply Authority
ZNOC	-	Zambia National Oil Company (in liquidation)

INTRODUCTION

The energy sub sector has been regulated for the past decade since the commencement of the Energy Regulation Board (ERB) operations in August 1997. Over the ten years the industry has undergone institutional, legal and structural changes that sought to align the sector to better meet the evolving challenges in the domestic, regional and international environments.

Although the Government's catalytic role in the energy sector continue to remain important, experiences over the last decade clearly demonstrate that further strengthening and continuous improvements in private sector participation through appropriate public policy, legal, regulatory and financial incentives are imperative to attract further investments into the energy sector.

In the electricity sector, the ERB in 2007 adopted a new incentive-based regulatory methodology that encourages the regulated utility to improve its performance through Key Performance Indicators (KPIs) that, in turn, form the basis upon which subsequent tariff adjustments are based. Following the ZESCO Cost of Service Study completion in 2006, the ERB (through the 2007 Multi-Year Tariff Decision) has started the four year transition towards cost reflective tariffs that will allow the company to recover both its prudent costs and earn a reasonable return that will make it possible to undertake the necessary additional infrastructure expansion and maintenance programmes.

In line with the Government's new Energy Policy's objective of attracting more private investments, the ERB is expanding its regulatory scope and methodology to create a stable, predictable and credible regulatory environment that promotes Independent Power Producers (IPPs) and other off-grid power developers.

In the petroleum sub-sector, improvements in the security of supply were expected following the structural changes that took place in the domestic petroleum supply chain.

This Report highlights the developments in the energy sector during 2007 with specific focus on economic regulation, pricing, supply, investment, industry structure and competition. It also discusses the prospects and outlook for 2008 and beyond.

The Report is divided in two main sections, that is the Electricity Sub-sector and the Petroleum and Other energy forms.

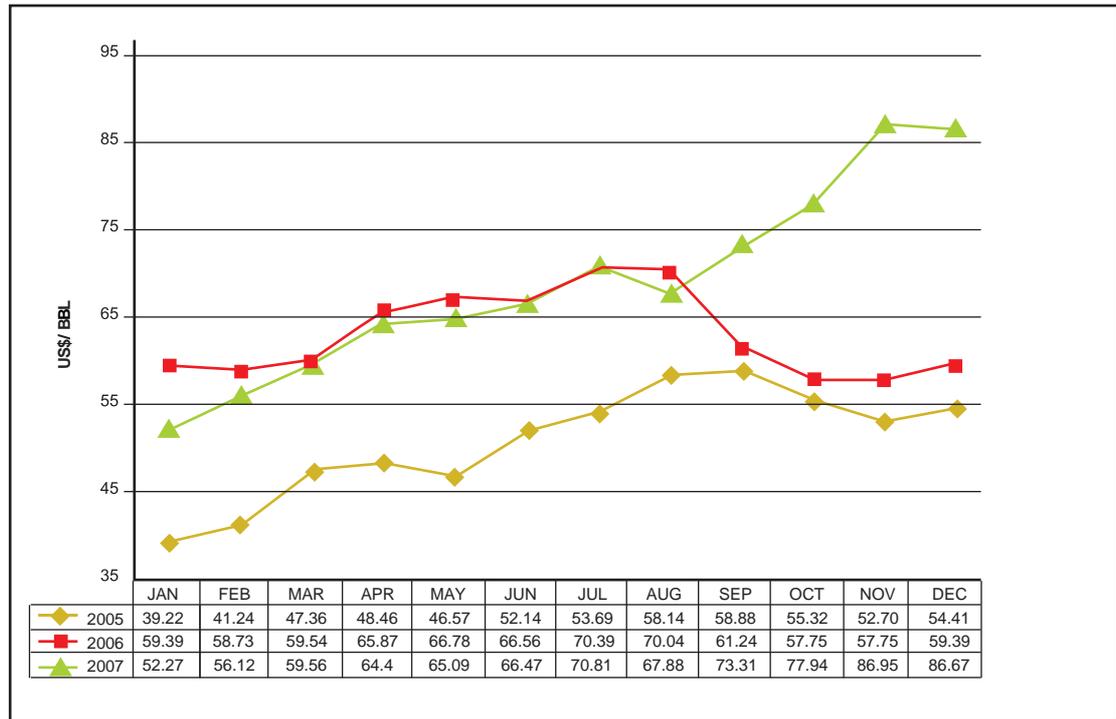
Developments in the Global and Regional Energy Markets

Developments in global oil prices during 2007 recorded unprecedented increases. Figures A and B show the monthly average price movements for both West Texas Intermediate (WTI) benchmark grade and Oman Crude for 2006 and 2007. For the period January to August 2007, the average prices for both crudes was either below (WTI) or very close (Oman) to that for the corresponding month in 2006. From August 2007 onwards, the prices sky rocketed from about US\$70/barrel to about US\$90 by the end of the year.



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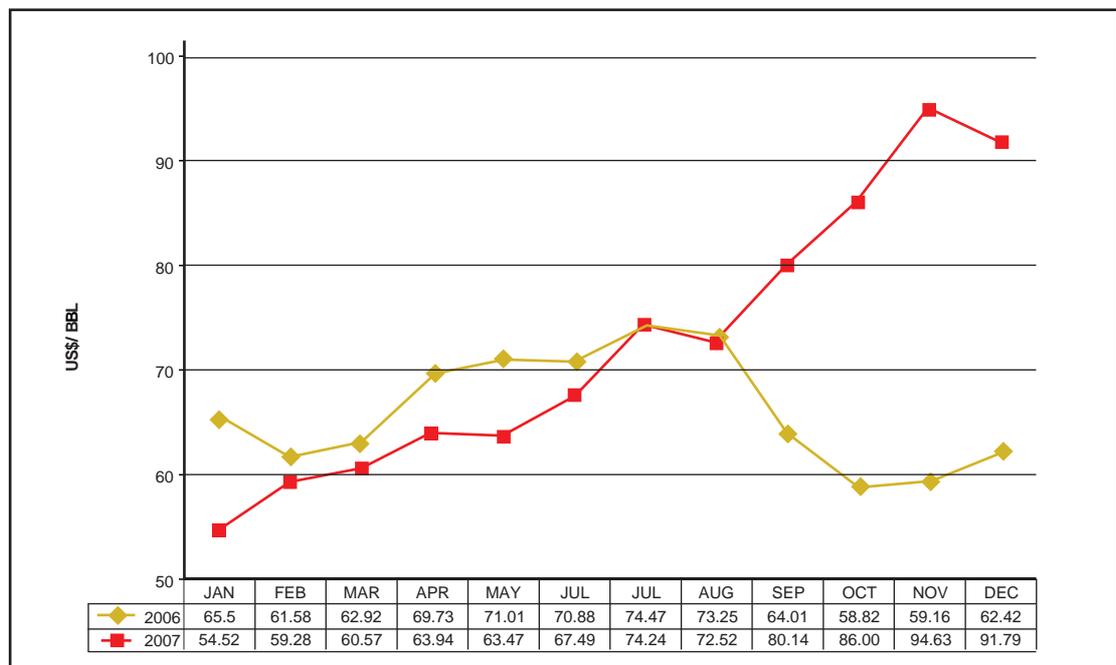
Figure A: Oman Crude Prices



Such an unprecedented price increase has been attributed to a combination of the following factors:

- The weakness of the US dollar against other currencies that has forced many financial market dealers to switch to commodities for hedging purposes.
- The continued production constraints in both OPEC and non-OPEC oil producers. For the first time, Russia's oil production registered declines.
- The ever increasing demand from China, India and other developing countries due to the rapid economic growth.
- Continued geo-political tensions - for example, the rebel attacks on oil facilities in Nigeria; and Iran's stand-off with the West concerning her nuclear program.

Figure B: WTI Crude Prices



With regard to the electrical power situation in the SADC region, SAPP's prediction that the region was to face power shortages from 2007 onwards materialized. The reasons for this regional electricity shortage are as follows:

- Demand outstripped supply largely on account of high economic growth that has averaged about 5% in most SADC national economies over the last five years as well as rural electrification projects in many of these countries.
- Inadequate investment in new capacity (for both generation and transmission) within the region. Even for existing capacity, low investments in rehabilitation works has resulted in availability of 46,391 MW out of the installed capacity of 54,742 MW.

Given the central role of energy goods and services in the development process, the foregoing challenging developments in the global oil and regional electricity markets provide the context in which the 2007 developments in Zambia's energy sector have been discussed in this report. In a nutshell, this report demonstrates some of the domestic challenges and opportunities such global and regional developments present to the Zambian economy.



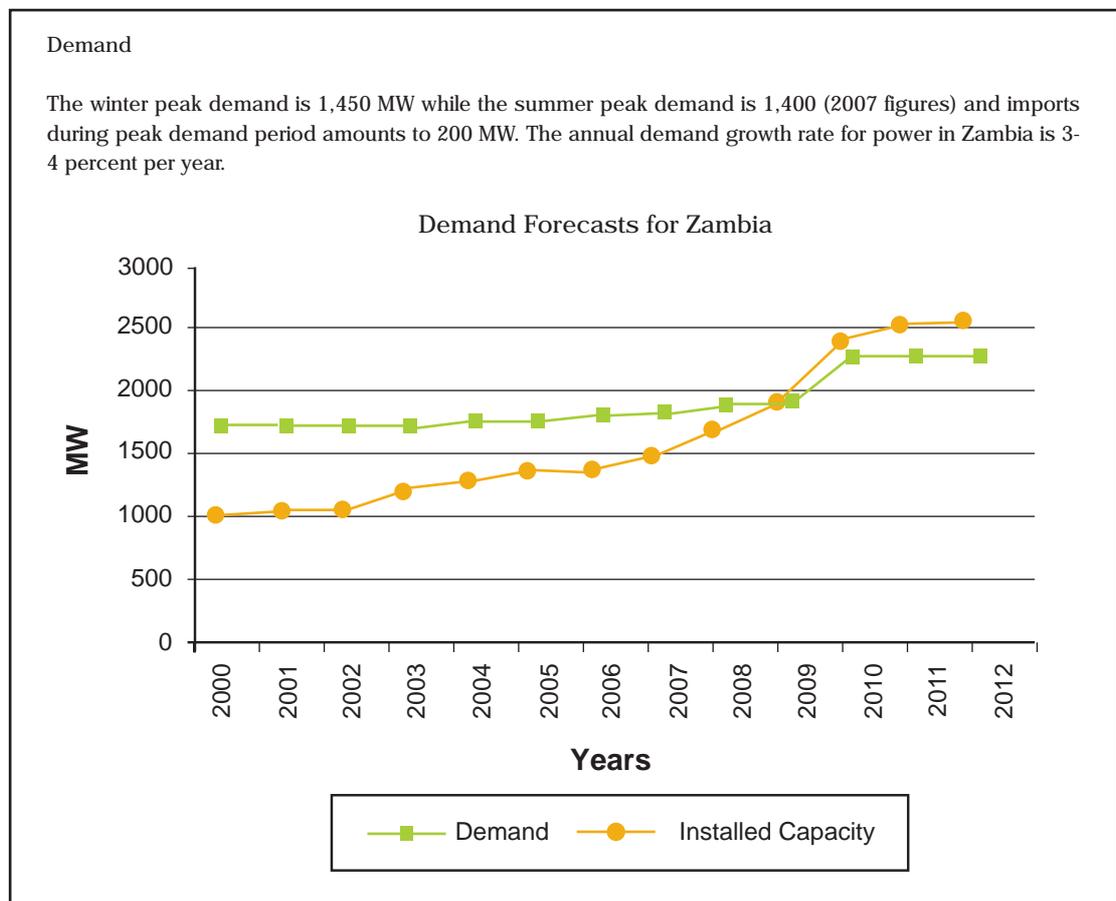
ELECTRICITY SECTOR

The Zambian power system is made up of four companies which are ZESCO Ltd, Copperbelt Energy Corporation Plc, Lunsemfwa Hydro Power Company and the newly commissioned Zengamina mini-Hydro Power Station.

The total installed generation capacity stands at 1,750 MW and of this 1,200 MW is currently available on the Zambian grid. The peak demand in the country is about 1,450 MW resulting in a deficit of 250 MW (2007 figures).

The demand profile and forecast for Zambia (Figure 1) shows that demand will begin to outstrip supply from mid 2008 and onwards.

Figure 1: Demand Forecasts for Zambia



Source: Adopted from ZESCO Profile 2007 publication

1.0 MAJOR DEVELOPMENTS IN 2007

1.1 Planned investments in Power Projects

The Electricity sub-sector has experienced continued growth in electricity demand over the past five years. This has primarily been driven by the strong growth in mining, industrial and domestic demand. These developments in power demand have rapidly put pressure on existing generation capacity that has been constrained by the ongoing power rehabilitation project resulting in power shortages that have led to increased load shedding. The power rehabilitation project is expected to increase total generation capacity by 210 MW at completion to 1,960 MW from the current 1,750 MW.

As a long term measure that is aimed at mitigating the power shortages being experienced not only in Zambia but in the whole of Southern Africa, a number of projects have been embarked upon to increase generation capacity. Some background work has been done on some of these projects (Itezhi-Itezhi, Kariba North Bank and Kafue Lower) where some infrastructure already exists. This could expedite the implementation of the three projects.

These power projects are highlighted hereunder.

Itezhi-Tezhi Hydro Power Project

In January 2007 ZESCO and TATA Africa Holdings launched a partnership agreement for the construction of the Itezhi-Tezhi power station on the Kafue River worth US\$190 million and a transmission line worth US\$80 million. This is a joint venture project.

Construction works were projected to commence in early 2009 and would take five years to complete. However, since the MoU was signed between ZESCO and TATA, there have not been any practical developments on the ground.

Kariba North Bank Power Station Extension (KNB)

The scope of works at KNB is to increase the capacity of the power station by adding two units of 180 MW each to the existing four. The new machines are to be integrated into the existing infrastructure. ZESCO concluded financing arrangements with China Export and Import Bank for the financing of the KNB-Extension power project. The project is expected to take four years to be commissioned in 2012 at a capital cost of US\$ 312 million.

A Construction agreement was signed at end of 2007 and will be undertaken by Sino-Hydro of China.

Kafue Gorge Lower Power Station

The other project to be developed is the Kafue Gorge Lower Power Station being spearheaded by the Ministry of Energy and Water Development. The advantage of this project is that the required holding dam will be small in addition to the fact that the area earmarked for development is uninhabited making minimal environmental impact. Commencement of development of the project is awaiting the selection of the developer earmarked for mid 2009.

Kafue Gorge Lower project is expected to be commissioned by 2014 at a capital cost of over US\$1.5 billion with generation capacity of 750 MW.

The project is planned to be undertaken on a public - private partnership basis and International Finance Corporation (IFC) is currently structuring the project before bids are invited from prospective developers.

Power Supply Projects to the Mines

ZESCO and CEC have continued to play a critical role in the development of the mining sector through the construction of transmission lines and the supply of power to the mines.

In 2007 ZESCO entered into an agreement to supply power to Albidon nickel mine in Mazabuka. Under this agreement, ZESCO undertakes to supply the mine its total power requirement of 7.5 MVA via a 25km 33 kV line from Kafue town. The total project costs are estimated at US\$2.2 million and Albidon Zambia Ltd made a capital contribution of US\$1.6 million.

ZESCO also completed the construction of a 72 km, 330 kV transmission line to Lumwana Mine in Solwezi. The project was completed in October 2007.



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Besides the Bulk Power Supply Agreement with CEC plc (supplying the Copperbelt mines), there are other mines with already existing agreements with ZESCO Ltd such as the Kansanshi mine in Solwezi supplied through the 330 kV line, and Bwana Mkubwa mine supplied at 66 kV.

The implications of these new mining loads is that they are putting stress on existing generation capacity given that the mines have firm power agreements with ZESCO and CEC.

Lunzua Power Corporation

During the year, the Kalungwishi power project was awarded to Lunzua Power Corporation as a preferred developer of the project by Government. An inter Ministerial committee was also appointed to commence the project *Implementation Agreement* negotiations. The project site is in Mpulungu in the Northern Province of Zambia.

The project involves the construction of a 210 MW generation plant at cost of about US\$780 million of which US\$590 million is the estimated cost of the plant and the balance of US\$190 million is for the associated transmission lines. The project is scheduled for completion by 2014.

CNMC Industrial Zone Development (CIZD)

The Zambian Government and the Government of the Peoples' Republic of China signed a Memorandum of Understanding to establish the Chambishi Multi Facility Economic Zone on the Copperbelt in 2006. The economic zone is expected to attract investment in the order of up to US\$850 million

CIZD was established to operate and manage the economic zone. The Company has applied for a license to distribute power within the zone. A bulk power supply agreement was entered into between ZESCO and CIZD to supply power up to a maximum demand of 110 MVA. The zone will comprise a number of commercial businesses including cable and textile manufacturing as well as the new Chambishi Copper smelter plant.

Transformer Plant in Zambia – EL-Sewedy Cables Ltd

As part of its strategy to reduce costs in transformer procurement, ZESCO entered into a partnership with El-Sewedy Cables of Egypt in 2007 to establish a plant in Zambia for the production of meters and distribution transformers of up to 5 Mega Volt Ampere (MVA).

The total investment cost of this project is US\$ 8.4 million. El -Sewedy Cables will own 60%, whilst ZESCO Ltd, Zambia State Insurance Corporation, ZCCM Investment Holdings and the National Pensions Authority will own 40% of the new venture.

The new plant in Zambia will have an initial production capacity of 1,200 transformers per annum. The plant operations are expected to commence by mid-2008.

Zengamina Hydro Power Station

Zengamina Power station (an Independent Power Producer) was commissioned in July 2007 and has a generation capacity of 750 kilowatts. It is an off-grid power station with its own distribution and supply system. The mini-hydro is located on the Zambezi River near Kalene Mission about 110 km from Mwinilunga in the North-Western province of Zambia.

The Company is owned by the North-Western Zambia Development Trust which has 90% shareholding and Mr Charles Rea with a 10% minority shareholding.

The total project cost was about US\$2.9 million and was mostly funded through donations from well wishers and a capital grant amounting to US\$25,000 from the Rural Electrification Authority.

The company serves three customer categories namely residential, commercial and services. Tariffs

range from US\$0.08/kWh to US\$0.11/kWh. The Bulk User Tariff Threshold (BUTT) is pegged at US\$0.30/kWh; i.e. representing a 75% of avoided cost on diesel expenses for large scale consumers like Celtel Zambia and Hillwood farm. With this development diesel users are estimated to save about US\$0.10/kWh when they switch to hydro power.

The site at which the new hydro plant has been developed has a potential capacity of about 2 MW. It was expected that 80 customers would be connected by the end of 2007. However, on account of difficulties in securing an appropriate transformer, supply to customers is expected to commence in 2008.

The project has a target customer profile that includes the mission hospital, government clinics, schools, churches, farms, millers, small commercial and light industries, and households.

1.2 Prepayment Metering Project

To reduce distribution losses and improve revenue collection, ZESCO continued with the prepayment meter installation project that was commenced in 2006 in the first phase of the project. By the end of phase one of the project in December 2007 a total of 23,000 prepayment meters were installed. The second phase to commence in 2008 is targeted at the installation of an additional 60,000 meters planned to be completed within the year.

2.0 PERFORMANCE OF THE ELECTRICITY SUB-SECTOR IN 2007

The performance of the electricity sub-sector in 2007 continued to grow in response to the increased economic activities taking place in the country. The major power consuming economic sectors of mining, quarrying, manufacturing, services, finance and property as well as trade continued to show strong growth exerting more pressure on the limited system generation capacity constrained by the PRP works.

2.1 ZESCO LTD

ZESCO is a vertically integrated utility involved in generation, transmission, distribution and supply. The company has an installed generation capacity of 1,640 MW, with Kafue Gorge 900 MW, Kariba North Bank 600 MW, Victoria Falls 108 MW, small hydros 24 MW, and thermal power 8 MW. Generation is predominantly hydro at 99% while the remainder is thermal. ZESCO has transmission and distribution networks throughout the country.

2.1.1 Generation from Major Hydro-Power Stations

Generation from major hydro-power stations of Kariba North Bank, Kafue Gorge and Victoria Falls recorded 9,570,230 MWh in 2007 compared to 9,611,531 MWh in 2006 representing a marginal reduction of 0.43%.

Individually the major hydro stations performed as follows:

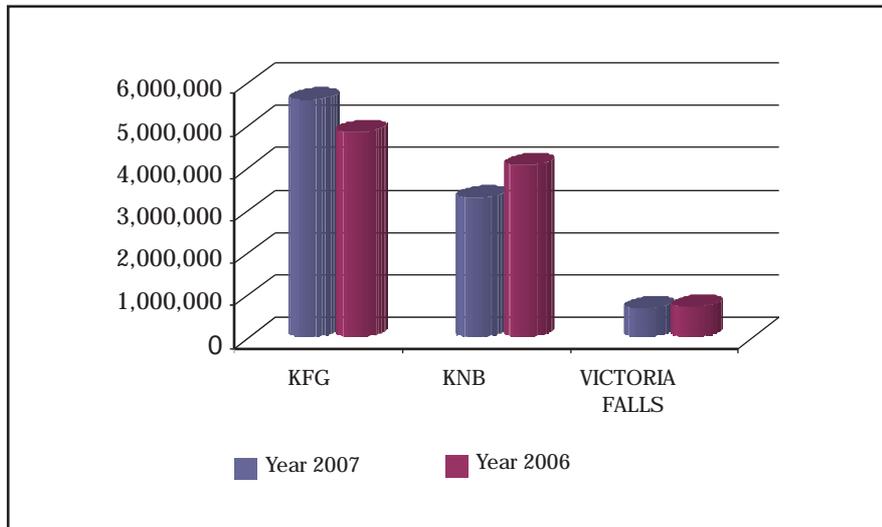
- Kariba North Bank Power Station: Recorded a 19% decrease in generation sent out in 2007 compared to generation sent out in 2006.
- Kafue Gorge Power Station: Recorded a 26% increase in generation sent out in 2007 compared to generation sent out in 2006.
- Victoria Falls Power Station: Recorded a 5% reduction in generation sent out compared to 2006.

The changes were mostly as a result of maintenance and uprating works under the PRP.



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Figure 2: Generation sent-out in MWh



Source: ZESCO, 2007

2.1.2 Generation from Mini-Hydro Power Stations

Generation from mini-hydro stations increased to 60,857 MWh in 2007 from 57,752 MWh in 2006 representing an increase of 5% as shown in Table 1 below.

Table 1: Generation from Mini-Hydro stations in 2007

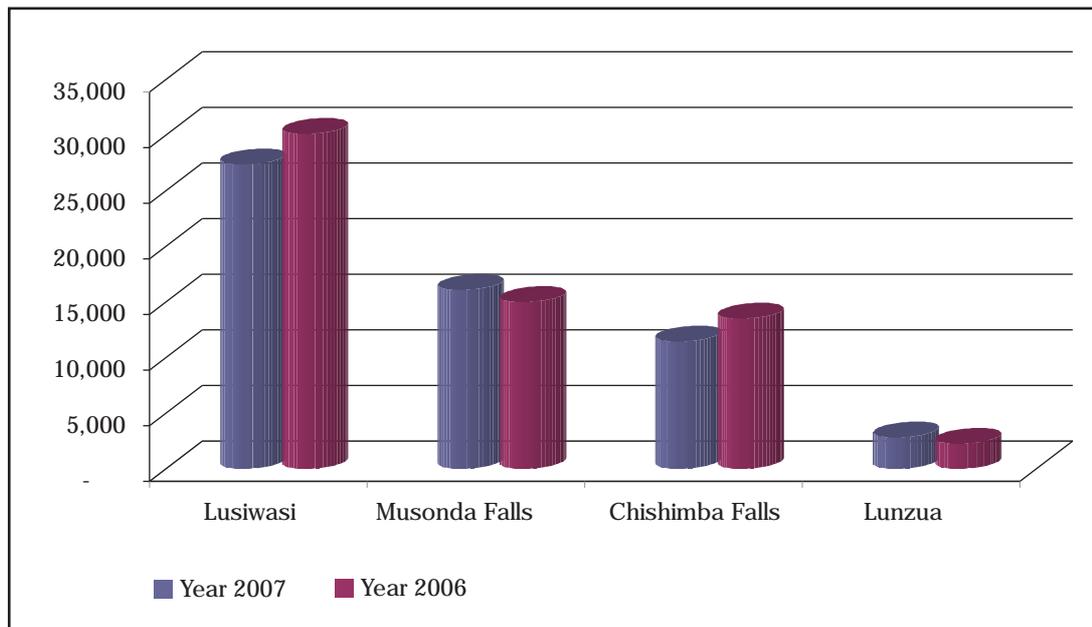
Hydro-Plant MWh	Installed Capacity	2006	2007	% Change
Lusiwasi	12 MW	27,384	30,120	10%
Musonda Falls	5 MW	16,084	14,988	-7%
Chishimba Falls	6 MW	11,459	13,501	18%
Lunzua	0.75 MW	2,825	2,248	-20%
Total	23.75 MW	57,752	60,857	5%

Source: ZESCO Statistics, 2007

However, on individual performance, analysis shows that Chishimba Falls hydro power plant recorded a significant increase in generation of 18% while Lusiwasi recorded a 10% increase in 2007 over the 2006 figures. Lunzua and Musonda Falls experienced operational problems and both recorded reductions in generation of 20% and 7% respectively.

Figure 3 shows a graphical presentation of the plants' performance in 2007 compared to 2006.

Figure 3: Generation sent-out from Mini-Hydro Plants in MWh



Source: ZESCO Statistics, 2007

2.1.3 Thermal Generation in 2007

ZESCO's total installed capacity for thermal generators is 8 MW. With the continued rise in the prices of crude oil on the international market, the off-grid thermal generation stations faced yet another challenging year to provide a sustainable service in rural areas.

All the diesel generation plants in the country recorded decreases in energy sent out except for Luangwa that recorded a growth of 44% in energy sent out. Total generation from thermal stations declined by 10% from 13,069 MWh in 2006 to 11,733 MWh in 2007. This reduction could be attributed to the high cost of diesel and the frequent break-down of equipment.

Table 2 below gives a detailed analysis of generation from diesel stations from around the country:

Table 2: Diesel generation in 2007 in MWh

Diesel station	Installed Capacity	2006	2007	% Change
Kabompo	1.5	2,759	2,078	-25%
Chavuma	0.7	701	597	-15%
Zambezi	0.8	2,201	2,159	-2%
Mwinilunga	1.4	2,469	2,169	-12%
Lukulu	0.5	1,109	1,050	-5%
Luangwa	0.7	783	1,128	44%
Kaputa	0.4	1,167	1,007	-14%
Mufumbwe	0.3	1,036	705	-32%
Chama	0.2	836	840	0.48%
Total	6.8	13,069	11,733	-10%

Source: ZESCO Statistics, 2007



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Major machine outages were experienced in July 2007 at Mufumbwe and Kabompo diesel power stations resulting in total generation loss for that month. To prevent such incidences ZESCO undertook to have at least two machines per station and have one mobile machine that could quickly be deployed to any area under emergency conditions.

At Mufumbwe the machine could only run for 16 hours a day instead of 24 hours (consuming about 1,200 to 1,500 litres of fuel) due to fuel constraints.

In Mwinilunga only one of the two machines was running due to technical faults resulting in a noticeable reduction in generation sent out for the year.

2.1.4 ZESCO Transmission and Distribution Losses

During the period under review, ZESCO recorded transmission losses averaging about 3.4% while distribution losses averaged 24.7%. This was a modest improvement when compared to 3.47% transmission losses and 25.16% distribution losses in 2006.

2.1.5 ZESCO Power Exports and Imports

Due to the power deficit that is being experienced in the country and the sub-region, ZESCO currently only exports excess off-peak and low voltage power.

The exports during the year 2007 were to ZESA of Zimbabwe and Eskom of South Africa between 22 hours and 06 hours for high voltage power. However, low voltage exports to border towns in Botswana, Democratic Republic of Congo, Namibia, Tanzania, and Zimbabwe were continuous. ZESCO exports were 337,678 MWh in 2007 compared to 287,772 MWh in 2006 representing an increase of about 17.3%.

Imports on the other hand were 232,953 MWh and 54,409 MWh in 2007 and 2006 respectively representing an increase of 328%. Imports of power were made from the Short-Term Energy Market (STEM) and/or from the Day-Ahead Market (DAM) of the SAPP trading arrangement.

Table 3: Imports and Exports

Years	Imports MWh	Exports MWh
2006	54,409	287,772
2007	232,953	337,678
Change	328%	17.3%

Source: ZESCO Statistics, 2007

2.2 Power Consumption by Economic Sector

Although ZESCO has continued to connect new customers for all categories to the grid, the total numbers of active customers have significantly fluctuated from year to year.

Table 4 shows ZESCO's customers by sector.

Table 4: Consumption by Sector

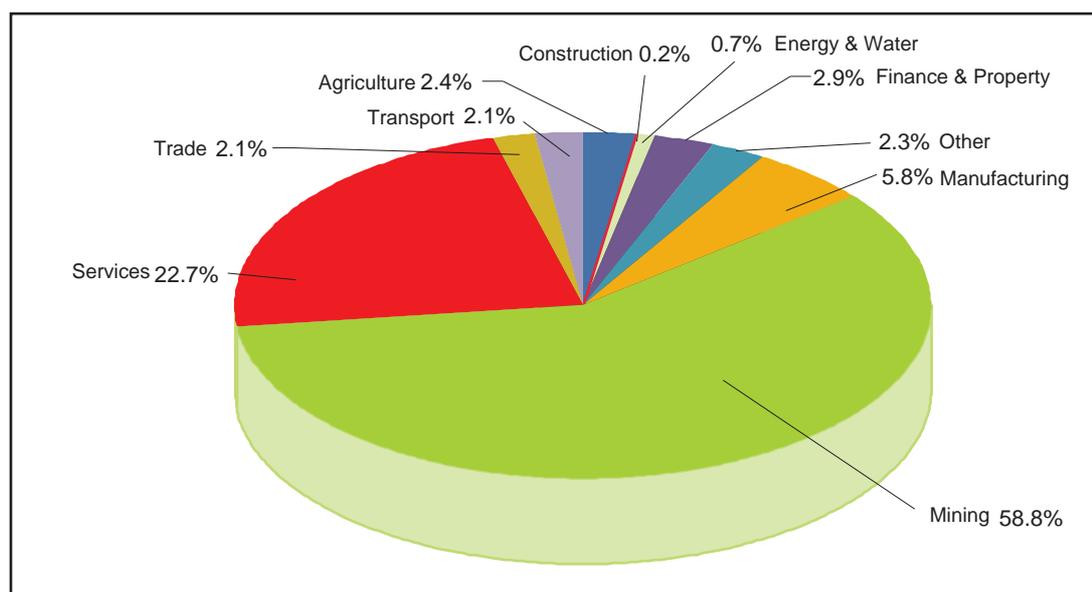
Economic Sector	Number of Customers	KWh Consumed	% Contribution
Agriculture	1,294	187,630,119	2.4
Construction	89	4,898,561	0.2
Energy & Water	264	59,326,589	0.7
Finance & Property	4,648	208,426,318	2.9
Others	5,693	197,965,211	2.3
Manufacturing	1,411	504,337,112	5.8
Mining/Quarrying	75	4,735,782,658	58.8
Services (Residential)	277,043	1,983,326,433	22.7
Trade	9,249	166,883,491	2.1
Transport	273	17,687,978	2.1
Total	300,039	8,055,347,632	100C

Source: ERB computations from ZESCO 2007 statistics

At 58.5% of total consumption, the mining sector is the largest single consumer category for electricity. This is followed by residential customers who account for 22.7% of total consumption. The two consumer categories account for 81.5% of total consumption. We show later in the report that these two consumer categories, tariffs are important in ZESCO's viability.

Further, Figure 4 provides a pie-chart indicating power consumption by sector in 2007.

Figure 4: Power Consumption by Sector



Source: ERB Computations 2007

Power consumption by the mines was 4,735,783 MWh in 2007 compared to 4,390,061MWh in 2006, representing a 7% increase. CEC supplies 86% of total mining load while ZESCO accounts for the remaining 14%.



2.3 Load Shedding

The Power Rehabilitation Project for ZESCO's generation infrastructure continued throughout 2007 resulting in some machines being taken out for refurbishment and uprating.

On account of this and the poor state of the related infrastructure, the country began to experience extended load shedding due to the power deficit at peak times. Furthermore, the increased economic activities in the country that are energy intensive have also placed increased pressure on existing generation and transmission capacity. As a result of this, ZESCO engaged major power consumers such as the mines to reduce their power consumption by about 5% to 21% of the declared demand. Residential consumers were also subjected to load shedding during peak periods¹.

2.4 Copperbelt Energy Corporation Plc (CEC)

CEC is a privately owned company involved in generation, transmission, distribution and supply. CEC's transmission (220/33KV lines) and distribution network consists of 835 kilometres of overhead lines and 36 high voltage substations. The current carrying capacity of the network is in excess 700 MW. CEC purchases the bulk of its power from ZESCO through a 20 year Bulk Supply Agreement (BSA) entered into in 1997. The BSA allows CEC to buy power up to 750 MW at an agreed price. The maximum demand for CEC in 2007 was 560 MW.

CEC serves the region by operating an interconnector with the Democratic Republic of Congo (DRC), which facilitates the wheeling of power from DRC to Zambia, Zimbabwe and South Africa. CEC also wheels power on behalf of ZESCO to its customers on the Copperbelt.

Some of CEC's mining customers include Mopani, Konkola, Luanshya, Chambishi, Chibuluma and NFC Africa Mining Plc.

During the year under review, ZESCO through Government initiated discussions to renegotiate mining tariffs with CEC. The tariffs are below cost reflective levels as estimated from the Cost of Service study completed in 2007. By the end of the year, negotiations were not yet concluded.

With the mines consuming about 58.5% of total electricity, a prolonged below cost tariff regime has adverse impact on ZESCO's financial viability, even when all other consumers were to pay at cost reflective level.

The key operational figures for CEC are highlighted below:

- i) Transmission losses were 2.34% in 2007 compared to 2.04% in 2006;
- ii) Net energy sent out from CEC's own generation facilities was 951 MWh in 2007 compared to 1,648 MWh in 2006;
- iii) Amount of electricity transmitted was 5,592 GWh in 2007 compared to 5,483 GWh in 2006;
- iv) Amount of electricity sold was 3,939,797,287 KWh in 2007 compared to 3,517,704,332 KWh in 2006 representing an increase of 12%; and
- v) Number of customers has remained fixed at 8 in 2007 as in 2006.

CEC generates 80 MW from its gas-turbine alternators mostly for emergency purposes.

2.5 Lunsemfwa Hydro Power Company (LHPC)

LHPC is an Independent Power Producer (IPP) which owns and operates two (2) hydro-power stations

¹ From January 2008, load shedding has since intensified in the wake of the national power blackout that occurred on 19th and 21st January 2008.

namely Lunsemfwa and Mulungushi with installed capacities of 18 MW and 20 MW respectively. LHPC sells more than 90% of its production to ZESCO while the balance is supplied to Chiman Manganese plant and Sable Zinc Company, both located in Kabwe.

Generation sent out from Lunsemfwa Hydro in 2007 was recorded at 264,500 MWh showing an increase of 39% from 161,170 MWh in 2006. This could be attributed to one repaired generator that was brought back on stream during the year.

2.6 Grid Code and Open Access Regime

The Zambian Grid Code (ZGC) outlines the operating procedures and principles governing relationships among users of the transmission system. These include electricity generation companies, transmission line owners, distributors, and large customers. The Grid Code specifies day to day procedures for both planning and operational purposes.

The code is designed to permit the development, maintenance and operation of an efficient, co-ordinated and economic transmission system to facilitate competition in the generation and delivery of electricity, thereby ensuring the transfer of efficiency gains to customers.

The grid code was approved by the ERB Board in January 2007 and was submitted to the Ministry of Energy and Water Development for policy guidance. It is envisaged that the grid code will be implemented by early 2009.

2.7 Rural Electrification Programme

The Rural Electrification Authority (REA) has continued with its rural electrification projects. A SIDA supported consultancy is assisting REA in becoming fully operational. This project component includes developing transparent and effective capital subsidy schemes, project selection criteria based on economic and financial principles, eligibility criteria and principles for the Rural Electrification Fund (REF) appraisals of project proposals. The REF will provide capital grants to project developers to extend the grid in rural areas while ZESCO will increase connections within its grid networks in peri-urban areas.

A Rural Electrification Master plan was concluded in 2007 with the support of Japanese International Cooperation Agency (JICA).

2.8 Power Rehabilitation Project Status

The PRP's overall objective is aimed at improving ZESCO's efficiency, quality and reliability of electricity supply and extend the life of its assets. The works involve two major components:

- 1) Generation and transmission infrastructure rehabilitation; and
- 2) Distribution infrastructure including power lines repairs and replacements as well as sub-station reinforcements.

The PRP commenced in 1998 and was scheduled to be completed by 2002. The initial cost was about US\$ 210 million but increased to US\$ 317 million due to changes in the scope of works from rehabilitation to include up rating. The other reasons for the delay included technical problems, late delivery of some repair components and delayed payments. However, works on transmission, distribution, institutional capacity building and environmental management have been completed. The overall project completion date is now set for September 2009.



3.0 ELECTRICITY PRICING

3.1 Cost of Service Study (CoS)

In the quest to improve operations and profitability at ZESCO, Government in 2003 commercialized the utility as opposed to privatization.

Commercialization of ZESCO’s operations presented significant challenges to ZESCO as well as to the ERB. IPA Energy Consulting was engaged in 2005 with the assistance of the World Bank and SIDA, to undertake institutional strengthening of the two institutions.

Under the Terms of Reference of this Project, IPA Energy Consulting conducted a Cost of Service Study from July 2005 with the final report released in March 2007. The purpose of conducting the Cost of Service Study was to determine a utility’s full costs of providing electricity for various categories of customers, at different points in the supply chain and within different geographical areas. A utility’s full cost of service includes its efficient operating costs plus an appropriate return on the assets necessary to produce, deliver and sell electricity to its customers and meet growing demand through prudent investments.

The Cost of Service study means setting ZESCO’s tariff level high enough to cover the costs necessary to meet its obligations to provide service at acceptable standards, meet its debt obligations, and to generate enough surplus (profits).

The results from the Cost of Service study revealed that the electricity tariffs are sub-economic for all customer categories, and if the tariffs were to be cost reflective then the tariffs had to be increased by the levels indicated in table 5.

Table 5: Cost of Service one-off Step-Up to Cost Reflective levels (in US cents)

Customer Category	Base Tariffs 2006/7	Cost of Service Step-Up	Cost Reflective Levels
Mining	2.34	28.50%	3.01
Residential	3.05	147.60%	7.55
Large Power	2.07	46.30%	3.03
Small Power	3.14	17.40%	3.68
Commercial	5.87	2.40%	6.01
Services	3.97	6.30	4.23
Exports	2.87	14.00%	3.27
Average	2.66	45.40%	3.87

It is critical to note that the tariffs have to be increased gradually over a number of years, before reaching economic levels due to the significant impact that a sudden increment would have had on the consumers and on the economy in general.

Other salient recommendations, arising from the Cost of Service study included the following:

- i. The adoption of the multi-year tariff framework as opposed to the one-off tariff determination that was prevailing at the time. It was proposed that a period of three years be adopted as both the ERB and ZESCO adjust to the new price control methodology. This recommendation has been adopted. ZESCO’s 2007 tariff review application was based on this framework.
- ii. The adoption of quarterly reporting schedule on performance statistics. It further recommended a set of measurable performance indicators related to visibly improving customer service to form part of its tariff path strategy. This was in view of the fact that the ERB and ZESCO had for a long time been locked in unproductive dialogue about “the numbers” and tariff levels without either organization

having an adequate database or proper analytical tools to inform their debate. This recommendation has since been adopted.

- iii. The Report noted that the under pricing of mining contracts places a huge burden on the Residential consumers who have to pay about 30% more than their fair share of revenue requirements. The Ministry of Energy and Water Development, ERB and ZESCO would therefore have to work together to rebase the mining tariffs as well as ensure that all future contracts are cost-reflective. ZESCO is currently negotiating with CEC, on the revision of mining tariffs to cost reflective levels.
- iv. The study results showed that the planned new large hydro plants are basically needed to serve the new mining, industrial and the export market. The implication is that the ERB should consider ring-fencing the cost associated with these new projects in order to protect domestic consumers who should not bear the costs through future tariff adjustments. This aspect was addressed through the pricing model.

It is also critical to note that investors can only be attracted to the power sector if the tariffs are raised to economic levels; this is particularly important given the power deficit which is obtaining in the country and in the region as a whole.

3.2 Multi-Year Tariff (MYT) Theory and Practice

Following the Cost of Service study undertaken for ZESCO by IPA Energy and Water Consulting of UK, the ERB has adopted a regulatory methodology reform process. This means a change in tariff setting methodology principles from the traditional "one-off tariff determination" Revenue Requirement (RR) methodology to a multi-year incentive based and performance benchmark regulatory methodology.

The aim of the regulatory reform process is to provide utilities with incentives to improve their investment and operating efficiency and to ensure that consumers benefit from the efficiency gains. International experience of regulatory reforms in the electricity sector has shown that there is a transition to adoption of incentive based regulation methodologies as an alternative to the traditional rate-of-return (ROR) or cost-of-service (COS) regulation of utilities. Regulators have adopted a variety of approaches to incentive regulation.

Incentive regulation schemes commonly use benchmarking as a tool, which is broadly defined as the... " *comparison of some measure of actual performance against a reference or benchmark performance.*"

According to the previous system of tariff determination, the utility is required to submit an annual filing (or as the need arises) of expected revenues from operating expenses and planned capital expenditure projects. The ERB has to either approve the tariff proposed by ZESCO or provide an alternative tariff based on data, assumptions and justifications provided by ZESCO. The system of annual tariff determination is too rigid, un-innovative and does not provide incentives to the regulated company to improve its performance nor does it compensate the company for factors beyond its control.

With the new methodology the objectives of regulation are:

- *Innovation*: innovation in the context of a MYT framework means encouraging the utility to find effective ways to cut costs and designing incentives to develop new and creative service offerings.
- *Improving customer service and satisfaction*: this generally requires the MYT principles to be accompanied with a reward/penalty provision to encourage compliance.

Furthermore, a multi-year tariff methodology ensures simplification of the regulatory process by laying down a tariff path for a defined future time period that is known, unambiguous and understood by all stakeholders who are then able to plan accordingly.

The design of regulatory as a part of the MYT exercise will help promote efficiency.



A key component of the MYT methodology is the KPIs that are embedded in the tariff order which have to be achieved by the utility in order to earn the subsequent tariff increases.

3.3 The 2007 ZESCO Tariff Application and Decision

In September 2007 ZESCO applied for a tariff review of an average increase of 60% for all customers. This was in addition to the other application for the revision of other charges, fees and penalties that had not been adjusted for a long time.

3.3.1 Key Drivers of the ZESCO Tariff Application

The key drivers of ZESCO application for an average tariff increase of 60% were as follows:

- i) All planned Capital expenditure projects were envisaged to be 90% debt financed
- ii) Rising costs of generation, transmission, distribution and supply equipment on the international market such as copper and oil
- iii) Huge and rising costs of electricity imports
- iv) Planned customer base expansion projects
- v) Cumulative inflation over the years that was not matched by increases in tariff levels
- vi) The Cost of Service study results that indicated that the tariffs were far below cost

As a Regulator, the ERB has a mandate to take into consideration the utility's justifications for a tariff application as well as the other stakeholders' submissions. In this regard key adjustments were made to the assumptions made by the utility in arriving at the requested tariff increase. These adjustments were as follows:

Loan Interest

In the application ZESCO assumed that 90% of new capital projects would be funded through loans while only 10% would come from internal resources. This assumption would have increased the gearing ratio of the company as debt would increase at dis-proportionate rates to equity. The ERB observed that debt should not exceed 70:30 debt equity ratio. Hence adjustments were made to the loan funding proportions from 90% to 70%.

The ERB also reviewed all interest rates on existing domestic loans as ZESCO had used a uniform figure of 23% on all local loans. It was noted that the current domestic loan interest rates were below 23%. The actual interest rates appearing in the ZESCO loan schedule were therefore used.

Staff Costs

In the financial year ended March 31st 2007, labour costs were the biggest component of costs which contributed 49% to total operating costs. The proportion of labour costs to the total budget was way beyond acceptable international levels which is about 30%. The ERB noted that there was an urgent need for ZESCO to begin reducing its labour costs. In that regard adjustments were made to projected labour costs' contribution to total projected operating costs to 40% for 2008, 35% for 2009 and 30% for 2010 after excluding extraordinary costs like electricity imports, loan interest rates and taxation.

Imports

In view of the projected electricity shortages, ZESCO had projected that they would need to import the following volumes; - 627 MW in 2009 and 823 MW in 2010. However it was observed that the Southern African region was expected to face a power shortage from 2008 due to increased economic activities in the region which did not match investment in generation infrastructure. It was established as a fact that ZESCO did not have the requisite transmission capacity to bring in the projected imports. An adjustment to the projected cost of the imports was therefore made to reflect a more realistic level taking into account the fact that most of the imports were to be made during peak times.

Table 6: Proposed against Approved Multi-year Tariff Adjustment rates (The Tariffs in US cents/kWh are in brackets)

Customer Category	2008	2009	2010
RESIDENTIAL			
<i>Zesco Proposed</i>	45% (6.43)	37% (7.99)	29% (9.65)
<i>ERB Approved</i>	26.8% (5.59)	16.6% (6.25)	11.9% (6.57)
COMMERCIAL			
<i>Zesco Proposed</i>	50% (7.46)	10% (7.87)	10% (8.05)
<i>ERB Approved</i>	1.3% (5.16)	0.3% (5.18)	0.3% (5.40)
SERVICES			
<i>Zesco Proposed</i>	49% (5.61)	22% (6.48)	21% (7.07)
<i>ERB Approved</i>	6.8% (3.97)	1.9% (4.05)	1.9% (4.33)
SMALL POWER (MD1 & MD2)			
<i>Zesco Proposed</i>	45% (5.02)	42% (6.02)	26% (6.78)
<i>ERB Approved</i>	16.2% (3.44)	5.5% (3.59)	4.5% (3.80)
LARGE POWER (MD3 & MD4)			
<i>Zesco Proposed</i>	75% (4.29)	55% (5.30)	29% (6.42)
<i>ERB Approved</i>	27.5% (3.22)	16.6% (3.29)	2.2% (3.50)

Source: ERB December 2007 tariff decision and Zesco Tariff Application

After the above major adjustments and other minor ones not highlighted here the ERB approved the tariff increase by the magnitudes as shown in table 6. Further details of ZESCO's application showing the tariffs applied for per kWh and per customer categories are presented in the appendix.

The 2007 tariff application also resulted in changes in the Tariff structure:

- Prepaid; the metered tariff category forms part of the new tariff schedules
- R1 R2 and R3 reductions/changes; R1 band was reduced from 300 kW to 100 kW, while the R2 band now caters for consumption between 101 kW to 400 kW and the highest consumption band now is for 401 consumption and above
- MD Customer category has been capped at 25 MVA
- Introduction of the ToU tariff; the other change is the introduction of time-of-use tariffs for consumption between 22:00hrs to 06:00hrs in the morning. The customers who enroll for this facility will now enjoy 50% discounts on capacity charges and 25% discounts on energy charges, for these hours.

The new tariff schedule after the adjustments and Board approval of the new tariffs effective 1st January 2007 are presented in Appendix 2.

3.3.2 Key performance benchmarks in the 2007 tariff decision

ERB and ZESCO agreed to several performance benchmarks to improve ZESCO's quality of service and improve efficiency. Some of these performance benchmarks include:

- Metering all customers by 2010 from present level of only 30% of metered customers,
- Reduce waiting period of new applicants for electricity connection from present 57 days waiting period to 30 days,
- Reduce debtor days from present level of 180 days to 60 days by 2010,



ENERGY REGULATION BOARD

- (iv) Reduce labour cost from present level of 48% of total operating cost to 30% by 2010,
- (v) Increase staff productivity from present level of 61 customers per employee to 100 customers per employee by 2010,
- (vi) Reduce outage hours per customer per month from present level of 32 hours to 5 hours by 2010,
- (vii) Reduce transmission and distribution losses from present level of 3.68% and 22.9% to 3% and 14% respectively by 2010.

Comprehensive definitions of the Key Performance Indicators (KPIs) are shown in the appendix.

3.4 Developments in the Southern African Power Pool (SAPP)

During the year under review, SAPP had a combined total installed capacity of 54,200 MW of which 45,700 MW was available against peak demand of 43,755 MW. A total of 1,440 MW was added to the SAPP system coming from South Africa and Tanzania.

Having established the Short-term Energy Market in April 2001 and the commencement of the establishment of a competitive electricity market in January 2004, SAPP has embarked on a new market to take the form of a Day-Ahead Market (DAM). The DAM trading platform was delivered and installed by Nordpool at SAPP Coordination Centre offices in Harare in February 2007.

A new Inter-Utility Memorandum of Understanding (IUMOU) was signed on April 25, 2007 which will enable other players in the sub-region such as Independent Power Producers (IPPs) and Independent Transmission Companies (ITCs) to join the SAPP and participate in all activities of the SAPP.

Also in April 2007 the SAPP and RERA signed a cooperation Memorandum of Understanding to work together in capacity building, harmonisation and exchange of information on their respective projects and actions.

3.4.1 Regional Inter-connections

The Zambian power system is connected to the regional interconnected system via two 330 kV transmission tie-lines to Zimbabwe, and one 220 kV line to the Congo power system. A new interconnection to Nampower is almost complete due for commissioning in 2008. The US\$12 million worth 220 kV power line from Victoria Falls to Sesheke project represents an upgrade to the existing 66 kV to "boost" electricity supplies between Zambia and Namibia. The project is a joint development between ZESCO and Nampower of Namibia.

The regional inter-connected system is operated under the auspices of the Southern African Power Pool (SAPP), which falls under SADC. There are twelve (12) member utilities of SAPP of which nine are interconnected, including ZESCO. The SAPP objectives are to coordinate the planning and operation of member systems and to promote energy trading among members in the region.

The total capacity of ZESCO's interconnections is 1,710 MW.

3.5 Challenges and Outlook

The electricity power industry plays a central role in facilitating accelerated economic growth in Zambia. However, the outlook for the sub-sector looks challenging:

- Power shortages: Currently Zambia is experiencing power shortages in the range of about 250 MW during peak times. Sticking to the PRP work completion schedule poses a challenge for ZESCO. This means the country will be subjected to load shedding until the rehabilitation works are completed.

The sustainability of the economic achievements made over the years are therefore threatened by the power outages.

It should be noted that the additional capacity that would result from the PRP will only provide temporary relief because the demand growth is projected to out-strip installed capacity in the next two years.

- New Investments in generation; Additional challenges lie in promoting and encouraging the private sector to invest in the generation capacity. A key issue in developing these projects will be to obtain the required financing above \$1.5 billion and whether ZESCO or Government should embark on the projects alone or adopt a private-partnership approach.
- Transition to cost reflective tariff levels; ERB has made it conditional under the multi-year tariff framework for subsequent tariff adjustments to be based on actual KPIs scores. The 2007 baseline analysis suggests that ZESCO will have a major challenge in meeting the KPIs.

The Power Utility Company also faces a big challenge in renegotiating cost reflective electricity tariffs with CEC and the mining companies.

- ZESCO's performance; Monitoring and improving the performance of ZESCO under the new multi-year tariff methodology poses challenges for the regulator, the company itself and the stakeholders alike. This is even more so that the subsequent tariff adjustments are linked to achieving KPIs. How the Regulator assesses the utility's performance vis-à-vis what the utility perceives as factors beyond its control creates grounds for disagreement.

Despite the foregoing the electricity sub-sector holds great potential for improvement and for providing the necessary driving force for enhanced economic development. The demand for power is increasing creating great potential for private investment in the sector with the transition towards cost reflective tariffs and the implementation of the open access regime.



4.0 DEVELOPMENTS IN THE DOWNSTREAM PETROLEUM INDUSTRY

4.1 New investment in INDENI Petroleum Refinery

In 2005, Zambia experienced prolonged and serious petroleum products shortages due to two unplanned shutdowns of the INDENI Petroleum Refinery Company Limited (INDENI). In its wake, the President of the Republic of Zambia appointed a Cabinet Committee to investigate the crisis. The objective of the Cabinet Committee was to come up with mitigation measures to resolve the fuel crisis as well as find a lasting solution regarding sustainable refinery operations. The Committee instituted an independent forensic audit that was carried out in 2006.

The audit covered technical operations, financial management and legal issues. Following its completion, the Cabinet Committee made two key recommendations:

- (a) urgent recapitalization of the Refinery for rehabilitation, and
- (b) revision of the shareholding structure of the refinery so as to invite a third equity partner.

A total of US\$65 million was required for the recapitalization of the Refinery. The Government and Total as shareholders agreed to provide US\$46.5 million and the balance of US\$18.5 million was expected to be provided by a third equity partner. However no tangible progress had been made on the issue of the third equity partner.

By the end of 2007, both shareholders had paid up US\$22.5 million each and rehabilitation works had been carried out in 2006 and 2007. The works mainly consisted of equipment and piping replacement, repair of the flare system and heat exchangers, and installation of diesel powered electricity generators.² As a result of these works, the reliability of the Refinery has improved.

The last phase of the rehabilitation includes upgrading of the refinery control system, more equipment replacement and repair of the furnaces.

INDENI Refinery in 2007

In 2007, the refinery had numerous unplanned shutdowns, five of which were due to the non-availability of feedstock. Towards the end of the Total Outre Mer (TOM) feedstock supply arrangement for INDENI, the supply became erratic. After the Government took over the responsibility of feedstock procurement, transitional delays further aggravated the feedstock supply situation resulting in product shortages on the market (July-September 2007).

Consequently, measures were put in place to ensure that the country was supplied with petroleum products. Oil Marketing Companies (OMCs) were requested to import finished petroleum products to meet the nation's fuel requirements. Overall, the refinery was shut down for a total of 113 days in 2007 compared to 119 days in 2006. The shutdowns in 2007 were mainly driven by the shortage of feedstock whereas in 2006 shutdowns were mostly attributable to technical problems.

4.2 Feedstock Procurement

In the second half of 2007, there were some major developments in the feedstock management system:

² The installation of the diesel powered generators has adversely affected refinery economics and in the medium term, INDENI will revert to mains firm power.

- In July 2007, the Government took over from Total the responsibility of supplying feedstock. Since November 2003 when Total Outre Mer took over the operations of ENI/Agip in Zambia, Total was the sole importer of feedstock for Zambia.

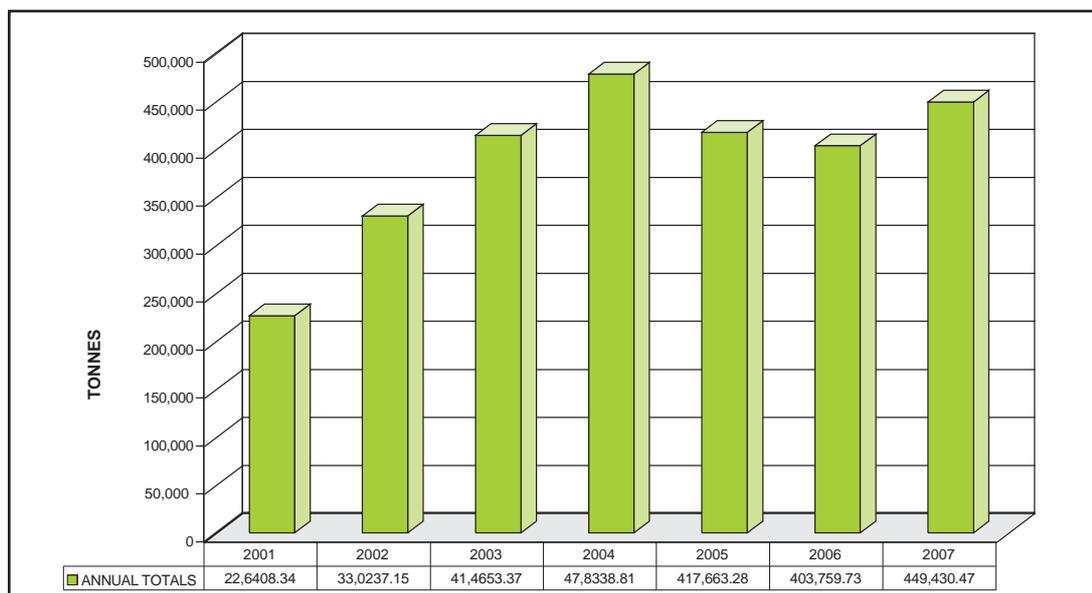
While long term feedstock supply arrangements were being prepared, the Government issued a 360,000 metric tonnes interim feedstock selective tender to six companies. However, the bids were found to be non-responsive and the Government then decided to single source Gallic Oil to supply 150,000 metric tonnes of feedstock. Finance Bank Zambia Ltd was appointed to finance the first 60,000 MT for cargo that began to be processed by INDENI from early October 2007.

As a result of these delays in the procurement arrangements, the country experienced some product shortages on the market.

- Later Gallic Oil transferred its contractual obligations to Lukoil Trading and Supply Company (Litasco) who supplied the next consignment of 60,000 MT of feedstock. The cargo which arrived in November 2007 was directly financed by the Government. By December 2007 when the last consignment of 90,000 MT of feedstock was being delivered, the erratic feedstock supply fears had eased.
- In October 2007, Government issued a long term feedstock tender. In December 2007, negotiations with Independent Petroleum Group (IPG) of Kuwait (the preferred bidder) were concluded for the supply of 1,440,000 MT of feedstock for a period of 2 years.
- In October 2007³, the Government appointed TAZAMA Pipelines Limited as its agent to manage the procurement of feedstock on its behalf. As such, TAZAMA assumed the added responsibility of wholesale marketing petroleum products to the rest of the petroleum market whilst continuing with its core business of pipeline transportation.
- INDENI refinery reverted to its core activity of feedstock processing and its main source of income is the processing fee that is determined by the ERB.

Despite the delays experienced in the supply of feedstock arising from this change in the procurement arrangements, the amount of feedstock the country received increased by 11.3 % from 2006 as illustrated below.

Figure 5: Trends in Feedstock Imports



³ The Agency agreement between Government and TAZAMA was finally signed in December 2007. However, TAZAMA had already begun operating as Government's agent when the first cargo arrived in October 2007.



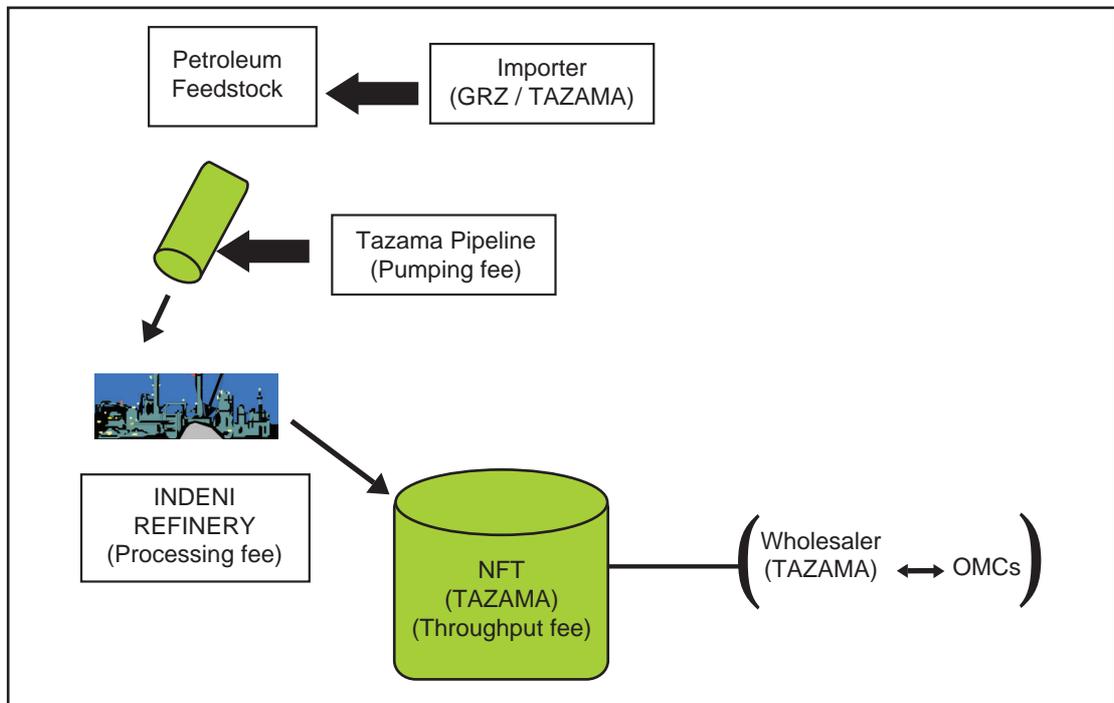
4.3 Management of the Ndola Fuel Terminal (NFT)

Following the liquidation of Zambia National Oil Company (ZNOC) in 2002, INDENI refinery was responsible for the running of the NFT and the wholesale marketing of fuel to the OMCs. However, in December 2006, the Government appointed TAZAMA to take over the operation and management of the NFT. Furthermore, TAZAMA was issued a wholesale marketing license in January 2007 for the bulk supply of finished products to the market.

The cost of managing the NFT is covered by a throughput fee that is determined by the ERB which is subject to periodic reviews. This ensures that the full costs of operating the terminal are met and reasonable recapitalization costs are provided for.

Following these changes, INDENI Refinery reverted to its core activity of feedstock processing. The new structure of the petroleum sub-sector is demonstrated in figure 6.

Figure 6: Structure of the Downstream Petroleum Industry



4.4 Distribution of petroleum products

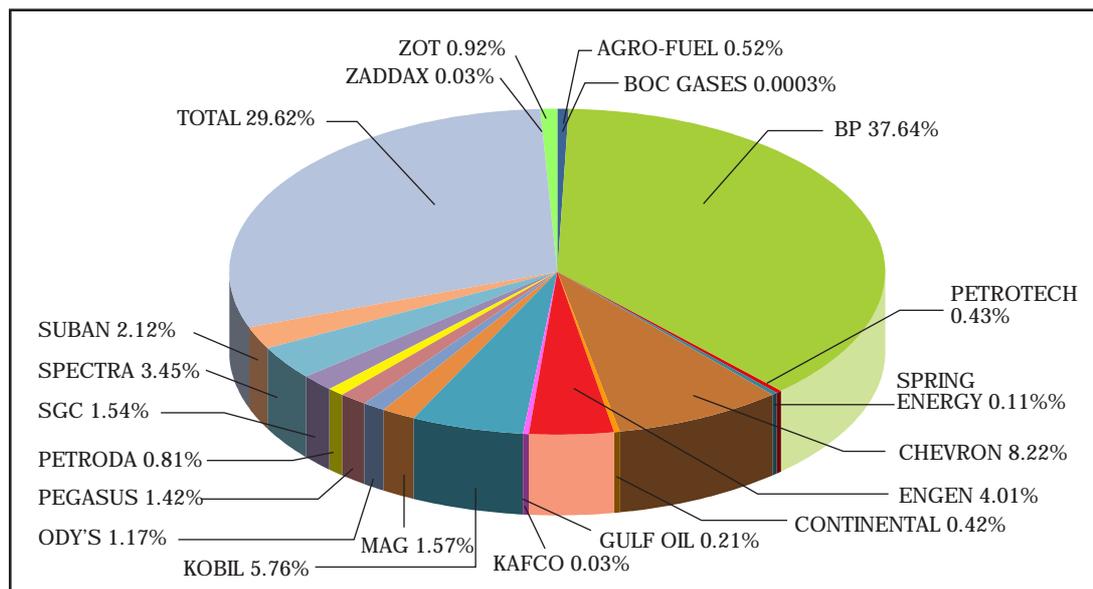
At the beginning of 2007, there were 19 licensed companies in the distribution of petroleum products. In the course of the year, five more OMCs entered the market:

- i. Amchile Import and Export Limited,
- ii. Anegi Oils Limited,
- iii. Mount Meru,
- iv. Spring Energy Corporation Limited, and
- v. ZADDAX Oil Trading Limited.

This increased the total number of licensed undertakings in the distribution of finished petroleum products from 19 to 23. This number excludes Goldstream Oil Ltd whose license was recommended for revocation following their failure to operate since they were licensed in 2005. In addition, Zambezi Oil & Transport (ZOT) had its licence temporarily suspended in the month of August 2007 due to non-remittance of strategic reserves fees. However, the suspension was lifted following their compliance.

As demonstrated by Figure 7, the increase in the number of new entrants did not change the market structure. The market structure continued to be dominated by three players, i.e. BP, Total and Chevron, who account for about 75% of the market (with BP at 37.6%, Total 29.6% and Chevron 8.2%).

Figure 7: OMC Market Shares as at 31st December 2007 – Fuels



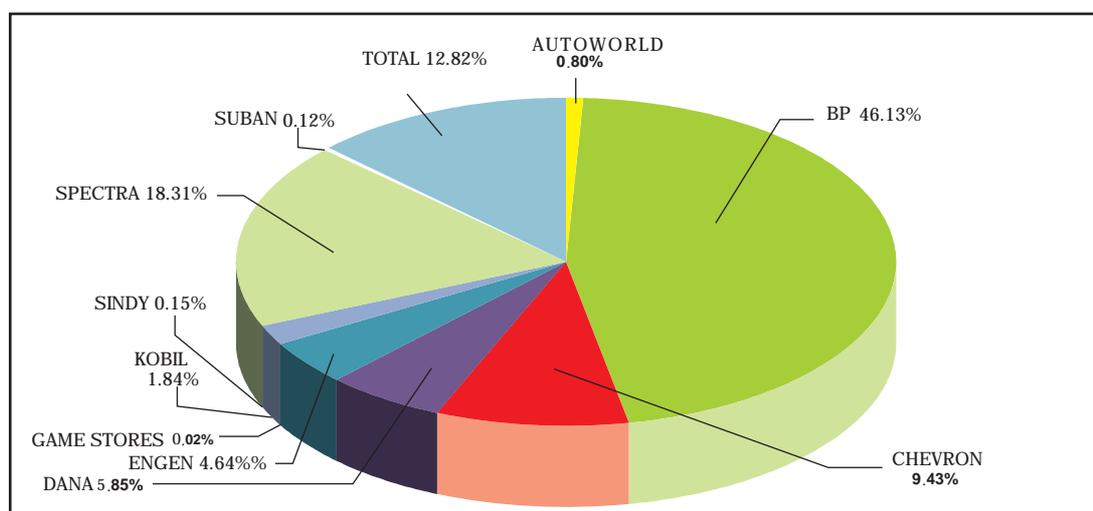
Source: ERB

The structure of the Jet A1 market continued to be dominated by BP accounting for 50% and Total 48%; with the other 2% taken by Spectra Oil Corporation.

BP and Mobil jointly own the Jet A1 infrastructure at the Lusaka International airport. According to the contract entered into, if one partner withdrew, the other party had the pre-emptive right to purchase the other's 50% share in the airport infrastructure. Following the take over of Mobil by Total in 2006, BP exercised their right of acquisition on the facility. However, the Competition Commission ruled against BP on this matter, i.e. wanted more OMCs/competition in the Jet A1 market.

The Lubricant market continued to be characterised by a large number of unlicensed operators. This poses a challenge regarding the accuracy of the data for this sub sector. BP continues to be the leader in this market followed by Spectra Oil, Total and Chevron.

Figure 8: OMC Market Shares as at 31st December 2007 – Lubricants



Source: ERB



4.5 The Move towards Cleaner Fuels – The Case of Unleaded Petrol

Throughout the world, *lead* has since the 1920's been used as a petrol additive to improve the quality of fuel and prevent the engine from "knocking". Petrol containing lead is commonly referred to as leaded petrol.

There has been a world-wide move to phase out leaded petrol given its effects on human health and the environment. In its place, unleaded petrol and lead replacement petrol (LRP) have been introduced. LRP is a transitional measure to the full use of non-metal containing petrol.

During the third quarter of 2007, the Government issued a ministerial pronouncement on the phase-out of leaded petrol in Zambia. The statement highlighted the following areas:

- The refinery would cease the production of leaded petrol on October 31, 2007; and
- The country would migrate to full use of unleaded petrol from March 31, 2008.

Following the announcement, the ERB was tasked to manage the phase-out of leaded petrol in the country. This resulted in the constitution of a Technical Committee on the Management of the Phase-out of Leaded Petrol, whose task included amongst others, the development of a strategy for the implementation of unleaded petrol and the development of communication strategies and public awareness campaigns. By the end of December 2007, Indeni had ceased the production of leaded petrol and was only producing unleaded petrol and LRP. In addition, appropriate communication strategies had been identified and a draft campaign message completed.

5.0 PETROLEUM PRICING – DEVELOPMENTS IN 2007

5.1 Fuel pricing in Zambia - the move from IPP to Cost Plus

Reliable and affordable energy supply is important for the development of any country. The challenge for regulators is ensuring that prices are not only affordable to the consumer, but also cost-reflective to allow service providers earn a just and reasonable return on their investments, thus enabling them to provide an optimal service.

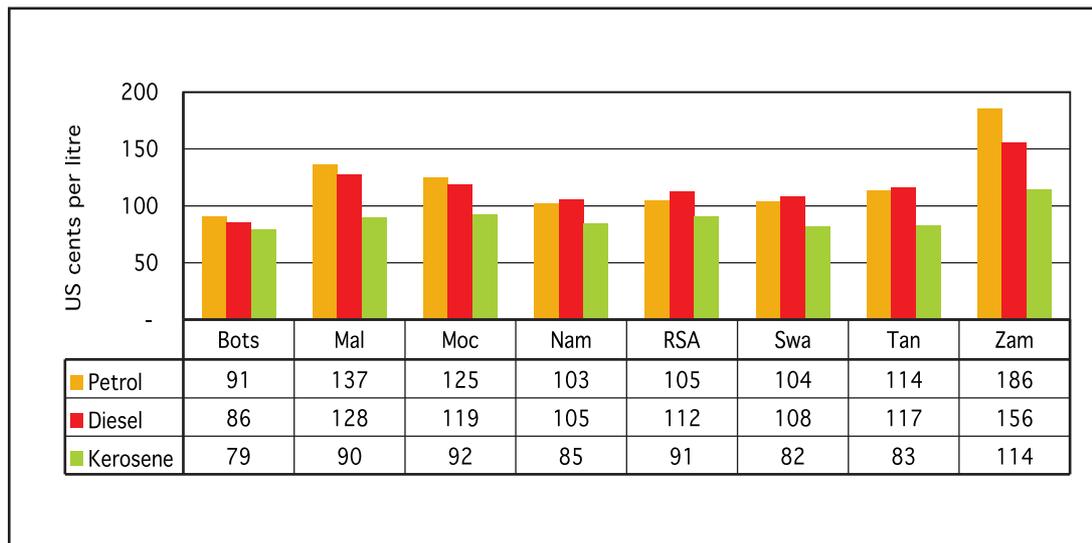
In 2007, the ERB continued to determine the wholesale prices for Petrol, Diesel, Kerosene and Jet A1 using the Import Parity Pricing (IPP) mechanism that was introduced in June 2004. It works on the premise of how much it would cost to import finished petroleum products into Zambia. The prices used are as quoted by oil price reporting agencies such as Platts and Argus.

The methodology was reviewed periodically to ensure that the cost elements in the formula are adjusted to reflect changing costs in the market. From inception, the IPP has been reviewed three times, in July 2005, January 2006, and in May 2007.

The high price of petroleum products in Zambia (as depicted in Figure 9) continued to trigger significant debate that led to the ERB holding a public hearing in May 2007. Some of the issues arising from this hearing were as follows:

- the monthly fuel price adjustments were too frequent and had an adverse impact on cash flow planning;
- the use of the rail/road mode in the IPP formula was unjustifiable given that the petroleum feedstock was transported through the pipeline; and
- the tax structure of petroleum products was too high.

Figure 9: Regional Fuel Prices as at 31st December 2007



Source: ERB

After considering all these factors, including the structural changes in the roles of the operators in the petroleum industry, it was decided to revert to the Cost-Plus pricing methodology.

The Cost-Plus methodology ensures that the feedstock importation and processing costs are recovered in the final price of petroleum products. The model relies on information provided by the importer, the most important document being the feedstock invoice, and other known standard costs in the supply chain. IPP's main appeal was to force efficiency in the supply chain. On the other hand, the main drawback of the cost-plus methodology is that inefficiencies are inbuilt in the price structure.

This model is not new to the sector as it was in use prior to the change-over to IPP.

The Cost-plus formula was implemented in early 2008. Appendix 4 highlights the key cost lines in the formula.

5.2 Petroleum industry margins

The ERB determines the benchmark downstream industry margins. In March 2007, revised margins became effective after the margins review process was finalized by the ERB.

Prior to the 2006 review, the margins were last reviewed in 2000. The margins were set by benchmarking with other countries in the region. This review was prompted by the need:

- to have a standard method of computing these margins; and
- for margins that covered operational costs in light of the appreciation of the kwacha against the US dollar.

The old margins were quoted in US dollars at US\$6/litre, US\$4/litre, and US\$ 2.6/litre for OMCs, dealers and transporters respectively.

The revised margins were computed using the Return on Capital Employed (ROCE) method. For this purpose, ROCE of 20% was applied and determined by benchmarking against global results of the leading OMCs and stakeholder interviews. The review focused only on the downstream retail business related to the distribution of petrol, diesel and kerosene.



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The revised margins are listed in table 7 below:

Table 7: Margins in the Retail Petroleum Sector

	Old* K/L	New K/L	Change %
OMC	256	345	26
DEALER	171	229	25
TRANSPORTER ⁴	111	148	25

*Note: The Bank of Zambia average monthly inter-bank exchange rate for the month ending March 2007 of K4,270 to US\$1 was applied.

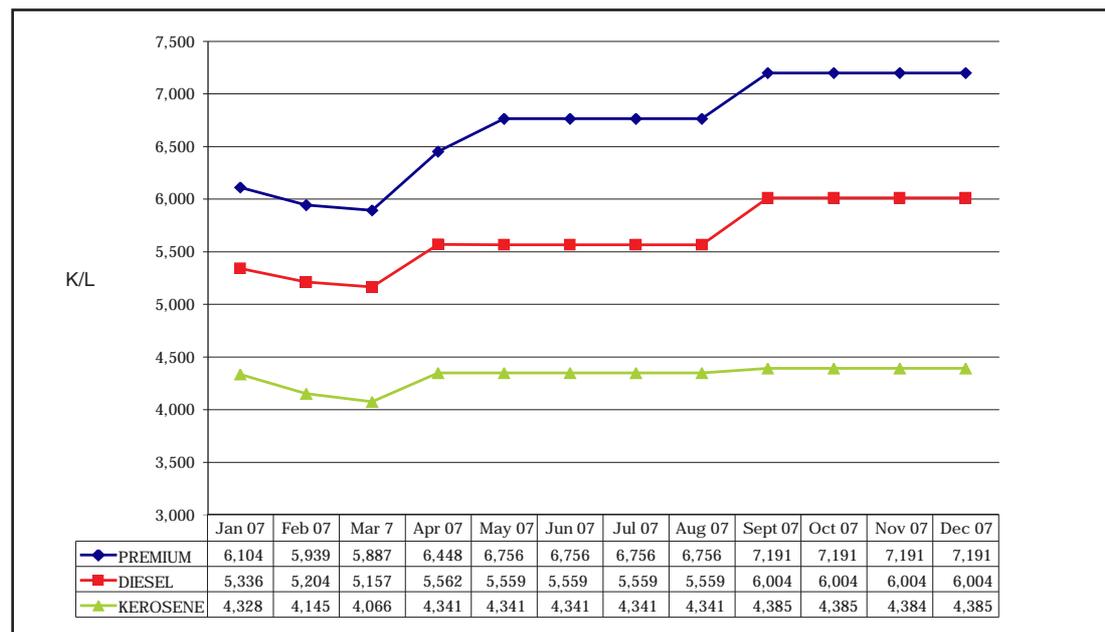
5.3 Domestic prices in 2007

On the world market, the volatile oil prices continued their relentless rise with oil prices almost hitting the US\$100/bbl mark⁵ during the year. The year began with crude prices at US\$61.05/bbl closing in at US\$97.92/bbl in December 2007⁶. The high oil prices were mainly on account of static production capacity that was accentuated by rising demand being driven by China and India.

On the domestic front, the price increases were gradual on account of increased Government support through subsidies.⁷

Figure 10 shows the trend in pump prices for petrol, diesel, and kerosene during 2007.

Figure 10: 2007 Average Lusaka Pump Prices



Source: ERB

⁴ The Transporters margin relates to the distance between Ndola and Lusaka of 321 kilometres. Therefore this varies depending on the destination and distance.

⁵ On 21st November 2007, oil prices on the New York Mercantile Exchange hit US\$99.29/bbl.

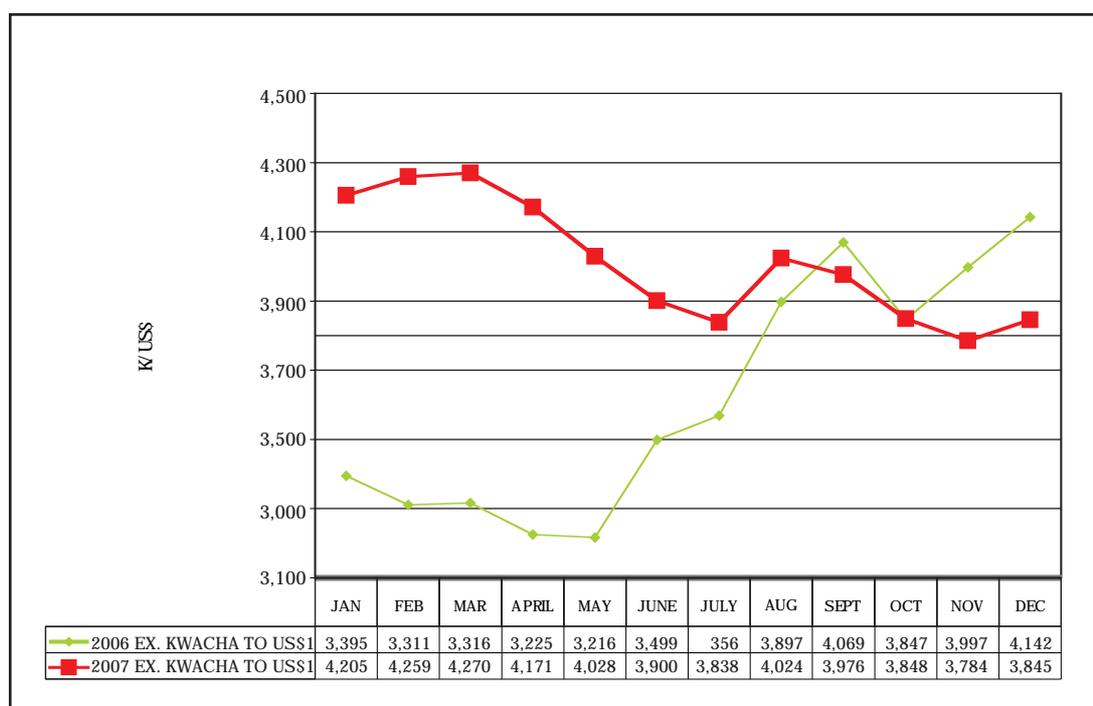
⁶ Refer to Appendix 5 to 7 for petroleum products price trends in 2007 on the international markets.

⁷ Refer to Appendix 8 for trends in wholesale prices.

With INDENI shutdown from July 2007, the country had to rely on imported products by the OMCs. These however, proved more costly due to the shortage of certain products in the region and the high freight costs hence the spike in prices recorded in September 2007. The prices for the last quarter of 2007 would have been higher but for Government's intervention through subsidies which maintained the prices at the September levels.

The Kwacha appreciated by 8.5% against the US dollar (see Figure 11) from January to December 2007. This also cushioned domestic price increases despite the high international oil prices.

Figure 11: Inter bank Exchange Rates 2007



Source: Bank of Zambia

5.4 Strategic Reserves Fund – the “stabilisation” role of the SRF

Arising from the fuel supply disruptions, the SRF was set up in December 2005 and the ERB was mandated to collect and manage these funds on behalf of the Government. The Fund's objectives were:

- i) The acquisition and holding of petroleum stocks equivalent to 30 days national consumption to be classified as National Petroleum Strategic Reserves (NPSR) for use in times of emergencies;
- ii) The rehabilitation of storage facilities at the Ndola Fuel Terminal; and
- iii) Stabilisation of petroleum prices (i.e. Petrol, Diesel, Kerosene and Jet A1).

The SRF resources are collected through a cost line in the price of fuel. The ERB determines an appropriate cost-line to be included in the price of Petrol, Diesel, Kerosene, and Jet A1. At the end of 2007, the SRF cost-line in the price of Petrol was K100/litre, nil (K0/litre) for Diesel, and K76/litre on Kerosene. The value of the cost-line has also been changing during the year as it is also adjusted to assist with price stabilization as reflected in Table 8:



Table 8: Strategic Reserves Cost-Line in the Price of Fuel, 2007

MONTH	PETROL K/L	DIESEL K/L	KEROSENE K/L	JET A1 K/L
January	152	100	152	152
February	249	203	76	152
March	249	203	76	152
April	249	203	76	152
May	249	203	76	152
June	249	203	76	152
July	249	-	76	152
August	249	-	76	152
September	100	-	76	-
October	100	-	76	-
November	100	-	76	-
December	100	-	76	-

Source: ERB

The primary objective of price stabilization is to insulate consumers from sharp increases in global oil prices so as to stabilize domestic final product prices. Fuel continues to be the major driving force for industrial, mining and agricultural processes and its cost forms an essential component in the cost of production.

In 2007, collections of about K77.1 billion were made and of this amount, K68 billion was paid to INDENI and OMCs for price subsidization.

6.0 NATIONAL CONSUMPTION

During the year 2007, the total consumption of white petroleum products (excluding LPG) increased by 14.5% from 555.8 million litres to 636.4 million litres.

Table 9: National Consumption of White Petroleum Products in Litres

PRODUCT	2006	2007	% Change
DIESEL	357,224,708	419,083,233	17.3%
PETROL	150,408,823	165,040,279	9.7%
KEROSENE	11,024,391	12,238,076	11.0%
JET A1	35,940,976	38,539,258	7.2%
AVGAS	1,249,468	1,521,062	21.7%
LPG*	2,311	2,072	-10.4%

*Note: LPG is in tonnes

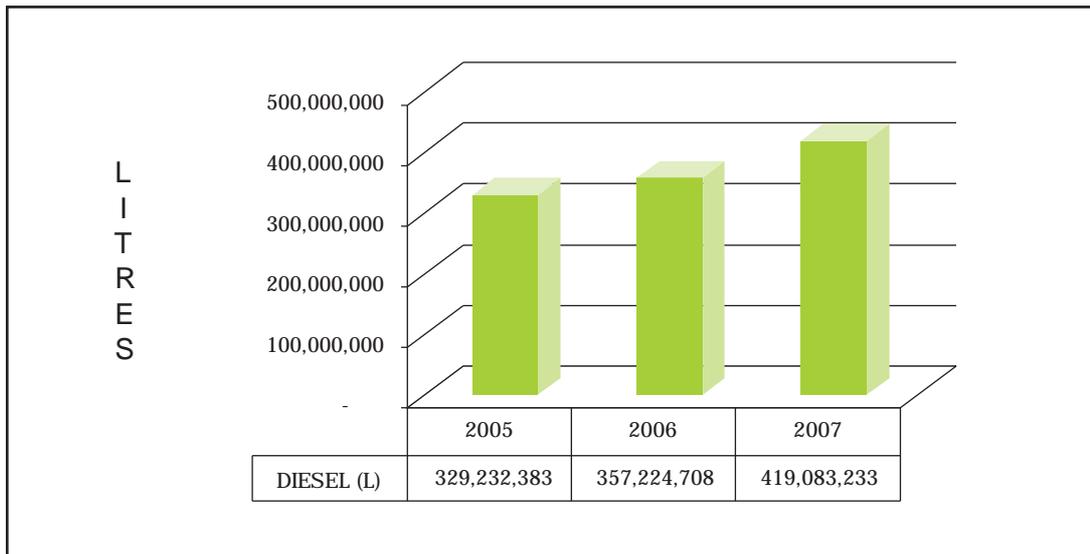
Source: ERB

There was a general increase in the levels of Diesel, Petrol, Kerosene, Jet A1 and Avgas consumed from 2006 to 2007. However, LPG volumes declined by 10.4% during the same period.

6.1 Diesel Consumption

In 2007, there was a marked increase in diesel consumption. The sales increased from 357 million litres in 2006 to 419 million litres in 2007 representing an increase of 17.3%.

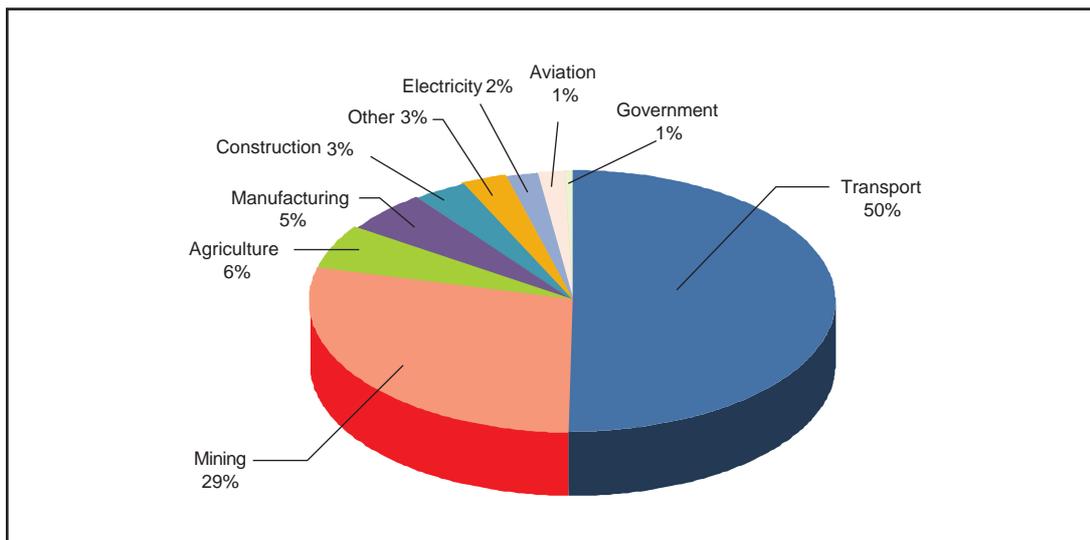
Figure 12: Trend in Diesel Consumption over the past 3 Years



Source: ERB

As illustrated in Figure 13, 50% of the diesel consumed was used for transport services, 29% by the Mining sector and 6% in Agriculture.

Figure 13: Diesel Consumption by Sector for 2007



Source: ERB

Mining activity continued to be robust during the year although the industry faced a setback from industrial action and widespread flooding after a heavy rainy season. Nonetheless demand for diesel remained upbeat and increased by 26% from the previous year. Kansanshi and Lumwana Mines in the North-Western Province accounted for much of this increase as Kansanshi increased its production levels in 2007 while Lumwana Mine made steady progress towards optimization. The mines are expected to continue registering increases in consumption of diesel in the near future.

The other sectors that registered a notable increase in consumption include the Manufacturing sector which recorded an 85% increase and Transport registered a 13% increase (see table 11).



Table 10: Diesel Consumption by Sector

	2007 VOLUME (m ³)	2006 VOLUME (m ³)	% CHANGE
Transport	210,604	185,665	13%
Mining	120,521	95,883	26%
Agriculture	23,114	25,096	-8%
Manufacturing	21,204	11,477	85%
Construction	14,080	14,796	-5%
Other	21,314	14,471	47%
Electricity	8,245	9,839	-16%
TOTAL	419,083	357,227	

Source: ERB

6.2 Petrol Consumption

There was a 9.7% increase in consumption of petrol⁸ from 150 million litres in 2006 to 165 million litres in 2007 as shown in table 11 below.

Table 11: Petrol Sales in Litres

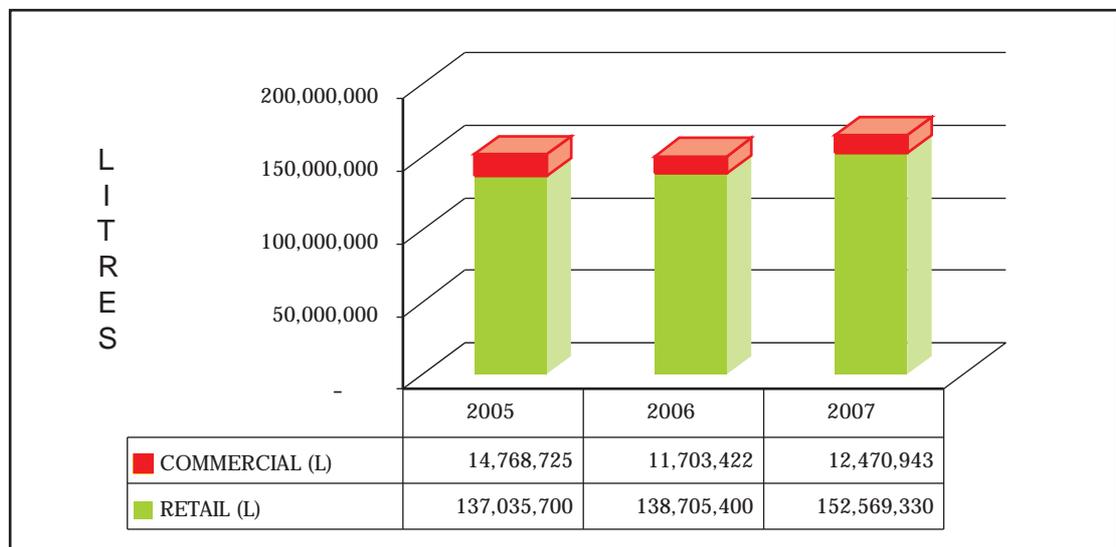
PETROL	2006	2007	% CHANGE
RETAIL	138,705,401	152,569,336	10.0%
COMMERCIAL	11,703,422	12,470,943	6.6%
TOTAL	150,408,823	165,040,279	9.7%

Source: ERB

Both retail and commercial sales increased in 2007. Retail sales refer to petrol sales made through service stations while Commercial sales refer to bulk sales made to bulk customers.

This increase in consumption is largely attributed to the continued importation of motor vehicles. The vehicle population continued to increase with the importation of 31,539 vehicles in 2007.

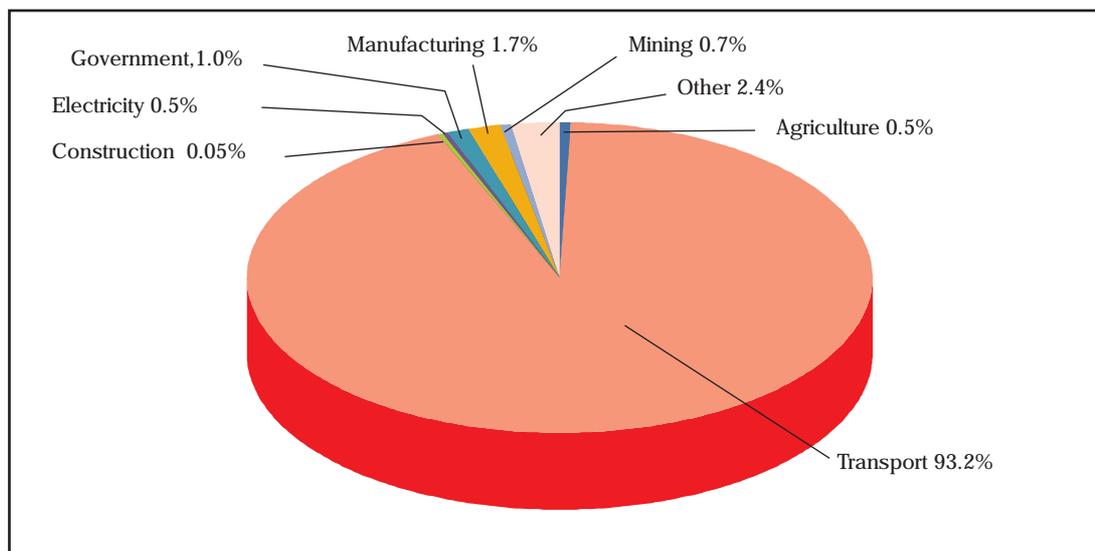
Figure 14: Trend in Petrol Consumption over the past 3 Years



Source: ERB

⁸ In this section, petrol refers to both unleaded petrol and leaded petrol.

Figure 15: Petrol Consumption by Sector in 2007

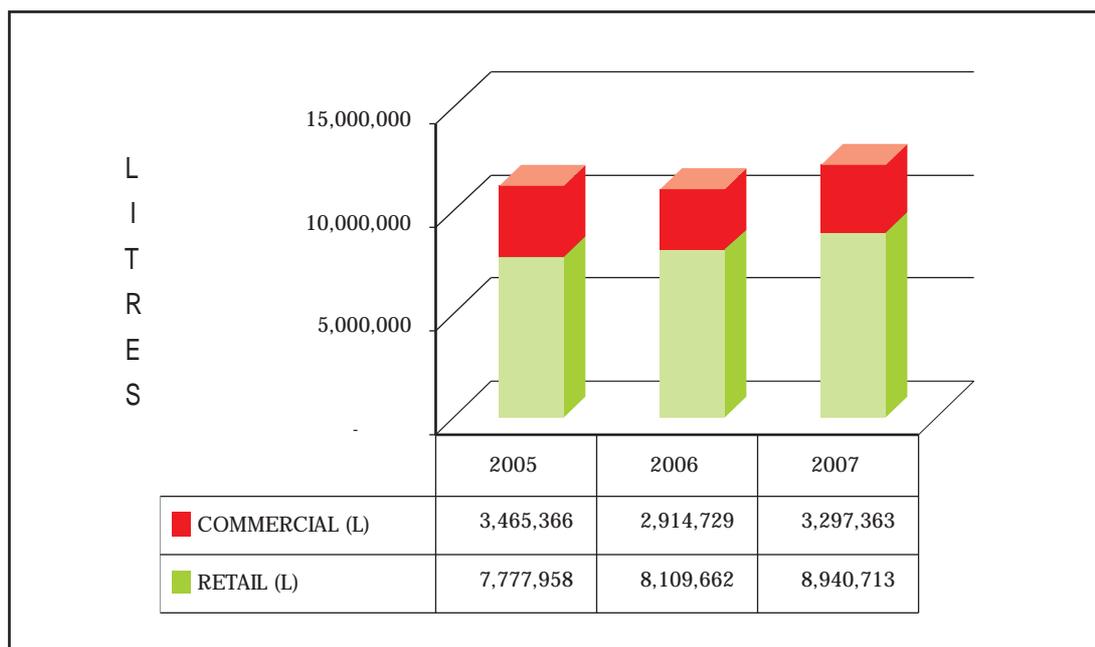


Source: ERB

6.3 Kerosene Consumption

Domestic Kerosene is used by households for lighting and cooking, whilst industrial kerosene is used in Agriculture and in other industrial processes. There was an 11% increase in Kerosene consumption from 11 million litres in 2006 to 12.2 million in 2007.

Figure 16: Trend in Kerosene Consumption over the past 3 Years



Source: ERB



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Both the retail and commercial sectors registered notable double digit growth figures in consumption in 2007. The retail sector accounted for about 73% of total consumption. Consumption of kerosene is expected to rise in 2008 given concerns of security of electricity supply as demand is expected to outstrip supply by early 2008.

Table 12: Kerosene Sales in Litres

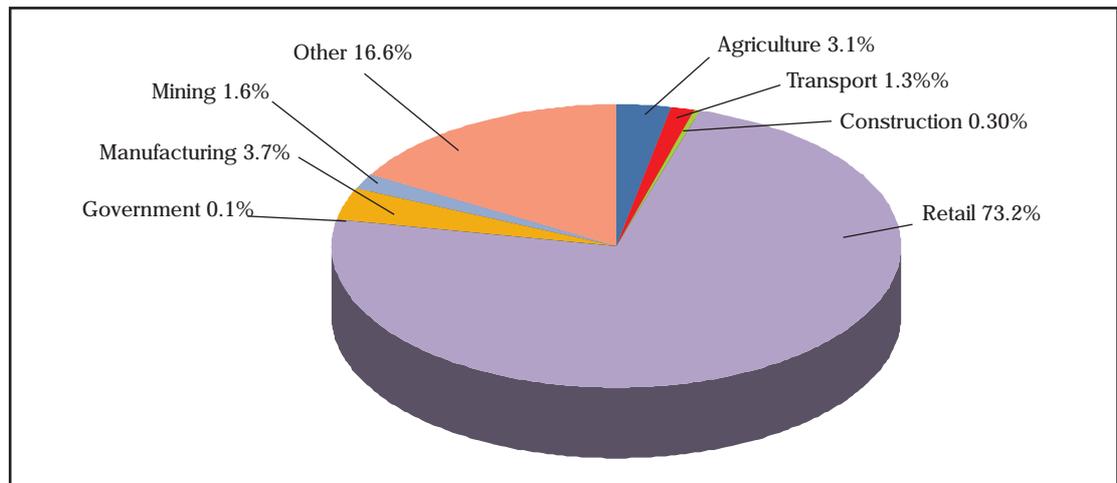
	2006	2007	% CHANGE
RETAIL	8,109,662	8,940,713	10.2%
COMMERCIAL	2,914,729	3,297,363	13.1%
	11,024,391	12,238,076	11.0%

Source: ERB

Table 13: Kerosene Sales in Percentages

	2006	2007
RETAIL	74%	73%
COMMERCIAL	26%	27%
	100%	100%

Figure 17: Kerosene Consumption by Sector in 2007

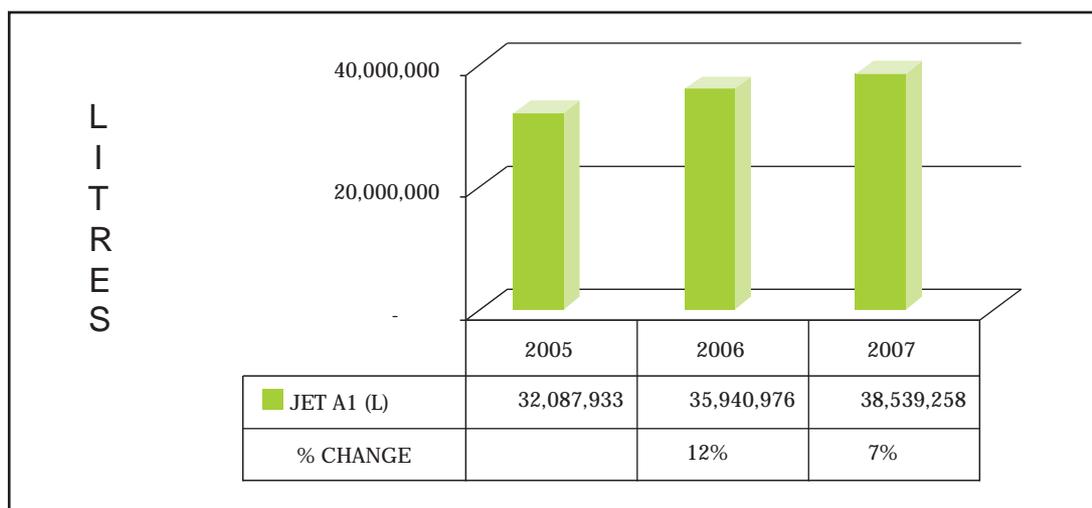


Source: ERB

6.4 Jet A1 Consumption

National consumption of Jet A1 increased by 7% to 38.5 million litres from 35.9 million litres in 2006.

Figure 18: Trend in Jet A1 Consumption for the past 3 Years



Source: ERB

The increase in consumption of Jet A1 in 2007 can be attributed to both national and regional factors. On the national front, the aviation industry continued to perform well as leading local airlines such as Zambian Airways continued to experience growth and expansion. The airline increased its passenger loads and number of flights following additions to its fleet.

Price instability and concerns regarding the availability of Jet A1 in some countries within the region also played a major role in driving national consumption in 2007. For example, South Africa recorded a significant rise in demand for Jet A1 which led to a situation where local airlines were given preference over international airlines. Therefore, the international airlines had to search for other markets within the region. Markets, such as Zimbabwe, were not very attractive due to the high prices owing to hyperinflation and exchange-rate instability. As a result of these factors, there was an increase in the volumes of Jet A1 sold due to the increase in the number of drop-in customers uplifting Jet A1 from the Zambian market.

6.5 Liquefied Petroleum Gas (LPG)

BOC Gases is the largest player in the LPG market and commands about 97% of the volumes traded. Consumption in LPG reduced by 10.4% from 2,311 tonnes in 2006 to 2,072 tonnes in 2007. LPG continues to be widely used in the hospitality industry for cooking.

There are various challenges surrounding the LPG industry that affect its availability and therefore have an impact on the consumption levels. In 2007, following the shutdown of INDENI, product availability was affected and the country had to rely on imports.

One other factor affecting supply is the quality of LPG produced at the Refinery. On occasion, the LPG from INDENI does not conform to the set specifications for the Zambian market and as such the grade produced (Butane) is exported to East Africa and not sold on the local market.



6.6 Heavy Petroleum Products

The mines are currently the major consumers of Heavy Fuel Oil (HFO) in the country while Light Fuel Oil (LFO) and Bitumen are used in other industries for various processes. The decline in consumption of HFO may be as a result of concerns that the mines had expressed about the price of the product. These concerns led to substitution effects, where the mines consumed less of HFO because of high prices and consumed close substitutes such as coal and/or electricity.

LFO also suffered a major substitution effect on the supply side as many suppliers opted to substitute it with used oil from the mines as it was easier to secure than LFO. Bitumen consumption remained stable over the same period. Currently, Zambia does not produce any Bitumen as the Bitumen plant at INDENI Refinery is closed and the country relies on imports.

Table 14: Heavy Petroleum Products

	2006	2007	% CHANGE
HFO (TN)	70,999	65,433	-7.8%
LFO (TN)	470	201	-57.2%
BITUMEN (TN)	43,000	43,350	0.8%

Source: ERB

6.7 Minimum Petroleum Stocks

Following the fuel crisis experienced in 2005, security of supply of petroleum products was greatly affected. In a quest to avoid the recurrence of a similar situation, and to ensure nationwide availability of petroleum products, the Energy Regulation (Minimum Petroleum Stocks) Regulation, 2005, Statutory Instrument No. 90 of 2005 was promulgated.

The Statutory Instrument (SI) places an obligation on a holder of a licence to distribute petroleum products to maintain minimum working stock. Section 2 of the SI defines minimum stock as "Volume of petroleum products adequate to meet the demand for petroleum products by consumers, over a period of fifteen days, calculated on the basis of a licensee's market share". The minimum stock to be maintained is determined by the Board based on the market share of each OMC.

Any OMC that fails to maintain 15 days stock in accordance with its market share commits an offence and is liable, upon conviction, to a fine of ten thousand penalty units. In addition to this, the ERB may recommend to the Minister for the revocation of the licence.

The Regulation allows the Board, upon the request of an OMC, to permit a draw down of the 15 days' stock minimum petroleum products when circumstances arise which necessitate such draw down. However, the OMC is required to rebuild these stocks once the circumstances which necessitated the draw down come to an end. These stocks are not part of the national strategic stocks which are supposed to be maintained by the Government.

During the period under review, the ERB continued to monitor the OMCs' compliance with the requirement to maintain 15 days' working stocks of petroleum products as stipulated in the SI. The results of these inspections showed that a number of OMCs were non-compliant.

Consequently, criminal proceedings were commenced against OMCs that failed to maintain 15 days' stock of petroleum products as stipulated by the SI. In this regard, seven OMCs were taken to court.

As at the end of 2007, only one case had been concluded and the concerned OMC has since paid the fine. The rest of the matters are still pending in the courts of law.

6.8 Quality of Fuel on the Zambian Market

In line with the ERB's mission *'To regulate the Energy Sector in a transparent effective and efficient manner that safeguards the interests of all stakeholders'*, the ERB undertakes sampling of petroleum products throughout the petroleum subsector as an avenue for protecting fuel consumers.

During the year ending December 2007, a total number of four hundred and thirty-six (436) fuel samples were collected from the provincial sampling inspections and sent to Alfred H. Knight's laboratory in Kitwe for quality testing. Both diesel and petrol showed an average failure rate of 55%. The average failure rate for unleaded petrol was 50%, while all the kerosene samples failed the test. Most samples failed on parameters such as lead content, end boiling point and Reid vapour pressure.

Further, the ERB carried out a random sampling of Copperbelt retail sites in November 2007. Whilst diesel and kerosene recorded a compliance of 88% and 100%, respectively, the results for leaded petrol and unleaded petrol ranged between 75-78% failure to comply with specifications.

Enforcement action was carried out and a number of OMCs were summoned for hearings before the ERB during the course of the year. OMCs were reminded of their duty to ensure product quality compliance as stipulated in their respective Retail Licence Conditions.



OTHER FORMS OF ENERGY

7.0 COAL

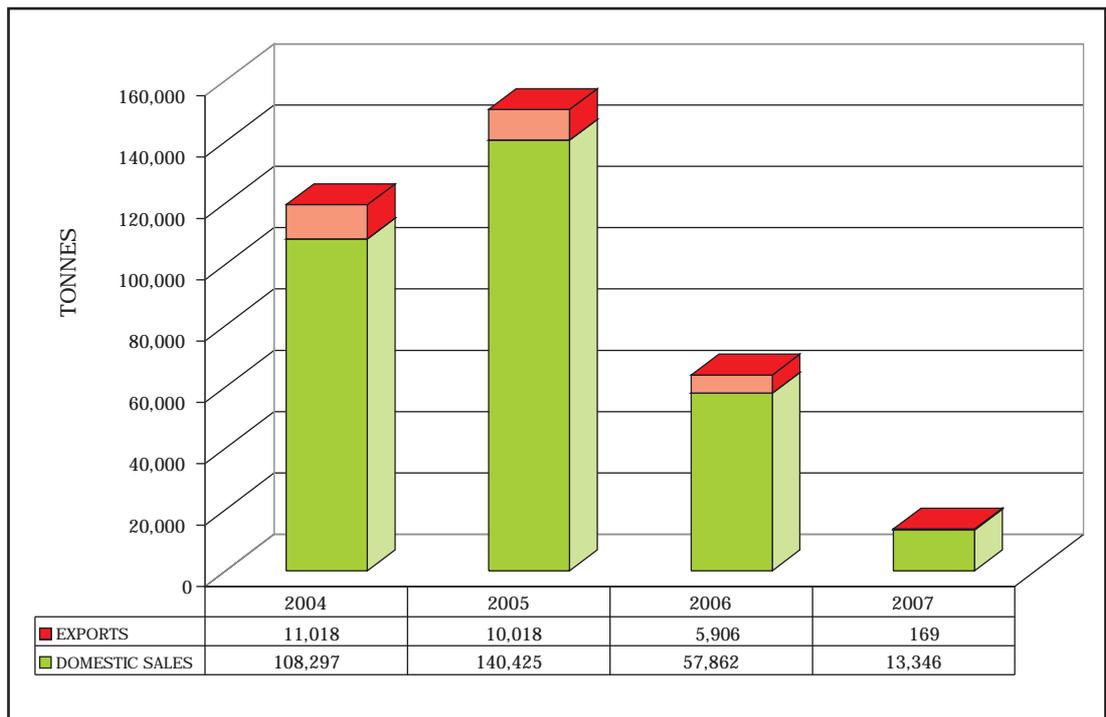
7.1 Maamba Collieries Limited

The ERB regulates the marketing of coal. Coal is an important source of energy in mining, chemicals, cement and brewery industries and in electricity generation. However, the Zambian market has faced scarcity in supply due to problems at Maamba Collieries Ltd. Collum Coal Mines is the other coal producer in the country.

Maamba was the biggest and main supplier of coal in Zambia until the company started facing operational challenges mainly as a consequence of its poor financial position and undercapitalization. Some attempts were made to privatize it earlier, but the deals did not materialise. In July 2007, operations were paralyzed at the mine when equipment was seized due to failure to honour a debt owed to a UK based company. These problems have led to a reduction in coal sales at the mine by about 79%, as can be seen from figure 19 below.

In a bid to revamp operations at the coal mine, Government decided to transfer the company to the ZCCM Investments Holding Plc (ZCCM-IH). ZCCM-IH is expected to recapitalize and rehabilitate the mine with the assistance of an equity partner. In addition, negotiations were held with creditors in order to discount the amounts owed to them. A scheme of arrangement was presented in the High Court and an order approved where Maamba paid 25% of outstanding debts as at 30th August 2007 and the balance written off.

Figure 19: Production and Sales Statistics for Maamba Collieries



Source: Maamba Collieries

It is reported that Maamba has an estimated coal reserve base of 78 million tonnes which if exploited to the full, could be a vital input for resolving the country's current energy crisis.

7.2 Update on Developments in the Biofuels Industry

The private sector has been very active and has continued to develop the biofuels industry through the cultivation of various energy feedstock crops. In addition, the first commercial pilot processing plant was set up in the industrial area of Lusaka for the processing of biodiesel.

Government has incorporated issues on biofuels in the new draft National Energy Policy to foster the development of the sector.

The ERB concluded the promulgation of product quality standards for Biodiesel and Bioethanol which would govern the allowable specifications of the two products on the Zambian market. These standards will be launched in 2008.

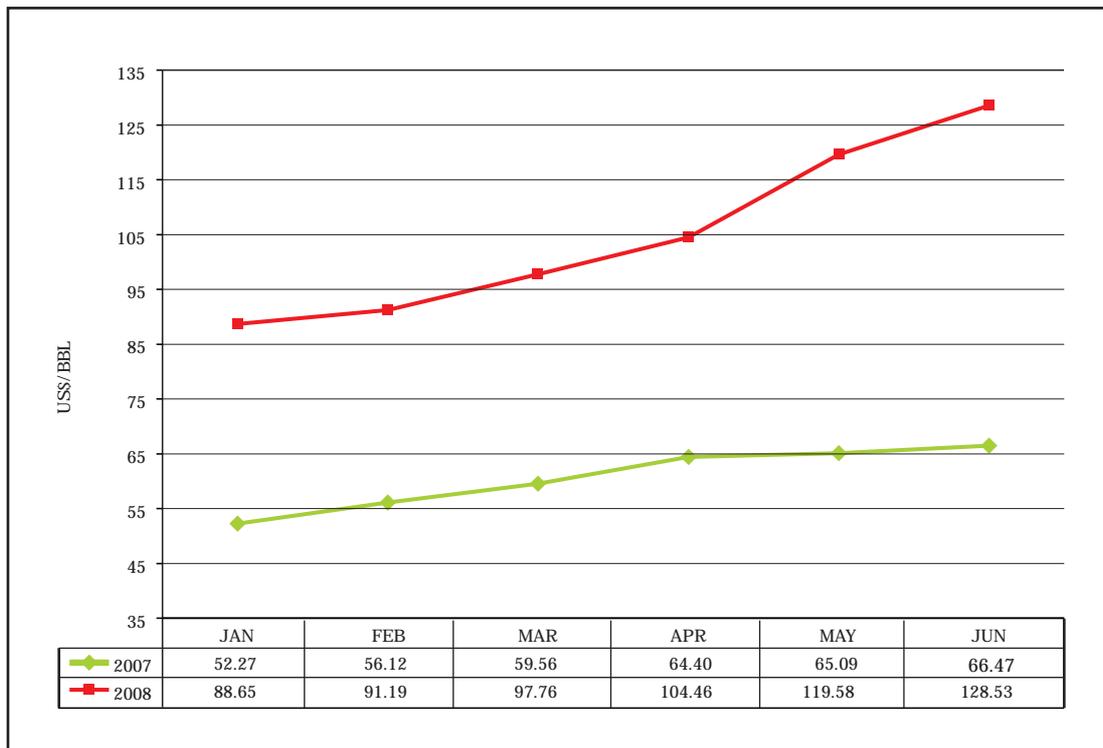


8.0 PETROLEUM PROSPECTS FOR 2008 AND BEYOND

Petroleum products are a major input in the production of goods and services and their quality, availability and affordability are very important for any economy. As demonstrated in this report, the prospects for petroleum industry in Zambia look challenging:

- Petroleum exploration: Despite the discovery of possible oil and gas reserves in the North-Western part of the country, a lot remains to be done in finalizing legal and institutional arrangements in order to facilitate the commencement of exploration works.
- Ageing infrastructure: Both the INDENI petroleum refinery and TAZAMA pipelines are over 35 years old and were designed for a much smaller economy. Without urgent investments in their rehabilitations/expansions, disruptions in fuel supplies that cause huge dislocations to the economy will continue. Other alternative supply options will need to be explored and effected.
- Petroleum prices: Prices in Zambia continue to be the highest in the region. The Government’s efforts to subsidize prices have proved too costly in the wake of the relentless increases in international oil prices. Crude prices in 2008 are significantly much higher than those for 2007 as shown in Figure 20 below.

Figure 20: Oman Crude Price 2007 and 2008



Source: ERB

Apart from the high basic product cost, the other factor that explains Zambia’s high prices compared to her SADC neighbours is the ad-valorem tax regime applied on petroleum products. At the end of 2007, excise duty and road levy were at 60% of the wholesale price on Petrol, 30% on Diesel and 15% on Kerosene.

Petroleum Products availability: Much of the country, especially rural areas, have no service stations and this has given rise to the problem of illegal fuel vending. This un-served demand will continue to limit Zambia’s growth prospects.

APPENDIX

Appendix 1: Electricity Summary Statistics

Month	Generation	Exports (Mwh)	Imports (Mwh)
Jan	834,943	90,865	-
Feb	717,903	47,278	7,675
Mar	785,367	16,290	24,572
Apr	766,170	28,100	12,520
May	823,542	56,950	16,040
Jun	806,200	10,120	35,150
Jul	822,461	4,715	60,955
Aug	846,436	2,690	29,490
Sept	829,469	12,505	13,450
Oct	853,551	21,305	9,580
Nov	861,597	39,580	2,440
Dec	792,908	7,300	21,080
Total	9,740,547	337,698	232,952



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Appendix 2: Proposed & Approved Tariff schedule for 2007

CATEGORY		Old Tariffs	ZESCO proposed Tariffs (ZMK)	ERB adjusted Tariff (ZMK)
1. UNMETERED RESIDENTIAL				
L1 – Consumption up to 2 Amps	(K/Month)	4,911	7,121	Nil
L2 – Consumption between 2 - 15 Amps	Energy Charge/Month	17,770	25,767	Nil
2. METERED RESIDENTIAL (capacity 15 kVA)				
R1 – Consumption up to 300KWh	Energy charge/KWh	70	102	77
R2 – Consumption between 301 & 700 KWh	Energy charge/KWh	100	145	127
R3 – Consumption above 700 KWh	Energy charge/KWh	163	236	207
Pre-paid Tariff	Energy charge/KWh Fixed Monthly Charge	111 5,845	161 8,475	141 7,411
3. COMMERCIAL TARIFFS (capacity 15kVA)				
C	Energy charge/KWh)	163	245	184
	Fixed Monthly Charge	29,227	43,841	33,027
4. SOCIAL SERVICES				
Schools, Hospitals, Orphanages, churches, water pumping & street lighting	Energy charge K/KWh	135	201	144
	Fixed Monthly Charge	23,382	34,839	24,971.98
5. MAXIMUM DEMAND TARIFFS				
MD1– Capacity between 16 - 300 kVA	MD charge/kVA/Month	6,943	11,803	8,068
	Energy charge /KWh	100	170	116
	Fixed Monthly Charge	68,002	115,603	79,018
MD2 – Capacity 301 to 2000 kVA	MD charge/kVA/Month	12,990	22,083	15,094,380
	Energy charge /KWh	85	145	99
	Fixed Monthly Charge	136,003	231,205	158,035
MD3 – Capacity 2001 to 7500kVA	MD charge/kVA/Month	19,587	34,277	24,973
	Energy charge /KWh	63	110	80
	Fixed Monthly Charge	272,006	476,011	346,808
MD4 – Capacity above 7500kVA	MD charge/kVA/Month	19,696	34,468	25,112
	Energy charge /KWh	52	91	66
	Fixed Monthly Charge	544,012	952,021	693,615
MD Time of Use	MD charge/kVA/Month		MD category, 25% discount on Capacity charge	MD category, 25% discount on Capacity charge
	Energy charge /KWh		MD category, 50% discount on energy charge	MD category, 50% discount on energy charge
	Fixed Monthly Charge		Applicable fixed charge	Applicable fixed charge

Source: ERB tariff schedules

The above tariffs are exclusive of Government excise duty and VAT

Appendix 3: Computation of Performance Benchmarks

1. CUSTOMER METERING

- √ Backlog metering: Prorate backlog stock as at 31 December 2007/12 quarters (i.e. January 2008-December 2010)
- √ New connections: number metered/new connections per quarter

2. CASH MANAGEMENT

- √ Trade Receivables/Turnover in relevant period being assessed) X 365 days
- √ Total payables/Turnover in relevant period being assessed) X 365 days
- √ Amount collected as % of total billing (i.e. collection rate of over 100% should signify a 100% collection for all current billings and an increasing reduction in outstanding debt)

3. STAFF PRODUCTIVITY (%)

- √ Total Number of Customers / Total Number of employees (Permanent + Temporary)
- √ Total Labour costs as % of Total Operating costs

4. QUALITY OF SERVICE

- √ (Sum of the product of length in minutes of each interruption and number of affected customers)/Total number of customers
 - √ (Sum of the product of the number of interruptions and the number of customers affected by each power cut)/ Total number of customers.
- SAIFI= (Total No. of Customer Interruption/Total No. of Customers served)/Year
 SAIDI= Sum(Customer Interruption durations/Total No. of Customers served) in hrs/Year
 CAIDI= Sum(Customer Interruption durations/Total No. of Customers served)/Hr
 ASAI= Customer Hrs service availability/Customer Hrs service demand

5. SYSTEM LOSSES

System Losses= KWh billed as % of KWh distributed to end users

Defined as Transmission losses (40% weight); distribution losses (60% weight).

NOTES

The key areas for which performance indicators are being developed will be understood to mean and include the following;

- 1) Customer Metering; In percentages (%) and absolute numbers – This is the percentage of or number of total customers who have a meter to measure their electricity consumption. Metering maybe in terms of credit meters or prepaid meters.
 - % number of customers metered
 - √ Measures progress on goal of metering
- 2) Cash Management; (Includes receivables, payables and stock management) - measures how a company utilises its cash.
 - Receivables as % of Turnover
 - √ Indicates amount of working capital tied up
 - Payables as % of Turnover
 - √ Indicates inability to pay suppliers (i.e. threat to security of supply)

3) Staff Productivity

It is noted that Staff productivity may be measured from different perspectives and at different levels of the electricity supply chain. However, for the purposes of the KPIs it will be understood to mean:

- Total Number of Customers/Total Number of Employees (Full time + Temporary employees)
 - √ Measures staff productivity at corporate level
- Total Labour Costs as % of Total Operating costs

Σ



- 4) Quality of Service
 - System Average Interruption Duration Index (SAIDI) – This gives an indication of how many minutes were lost by the average customer in a year. The definition of SAIDI is the sum of the product of the length in minutes of each interruption and the number of customers affected by the power cut. This is then divided by the total number of customers.
 - System Average Interruption Frequency Index (SAIFI) – This gives an indication of the average amount of interruptions experienced by a customer in a year. This is the sum of the product of the number of interruptions and the number of customers affected by each power cut. This is then divided by the total number of customers.
 - Customer Average Interruption Duration Index (CAIDI) – A measure of how long an average interruption lasts, measures utility response time to system contingencies
 - Average Service Availability Index (ASAI) – customer weighted average of the system and provides same information as SAIDI
 - Customer Minutes Lost
 - v Measures system reliability
- 5) System losses (split into Transmission and Distribution losses)

System losses refer to the total losses including technical and non-technical losses.

 - Measures unmetered consumption and non-technical losses,
 - v KWh billed as % of KWh distributed to end users

Appendix 4: Key cost lines in cost plus pricing model

1	Cost of petroleum feedstock * (Cost-Insurance-Freight)	
2	Ocean loss	0.3%
3	Wharfage	1.25%
4	Handling fees	US\$0.20/mt
5	TIPER fees	US\$0.75/mt
6	Finance Charges	1.30%
7	Collateral Manager	US\$1/mt
8	Tazama Storage fee	US\$2/mt
9	Pumping fee	US\$39/mt
10	TAZAMA loss	0.85%
11	Crude Oil Import Duty	5%
12	Agency fee	US\$15/mt
13	Refinery fee	US\$66/mt
14	Refinery loss	10%
15	Terminal loss on finished petroleum products (0.30% & 0.50%)	
16	Total cost ex-TERMINAL (US\$)	

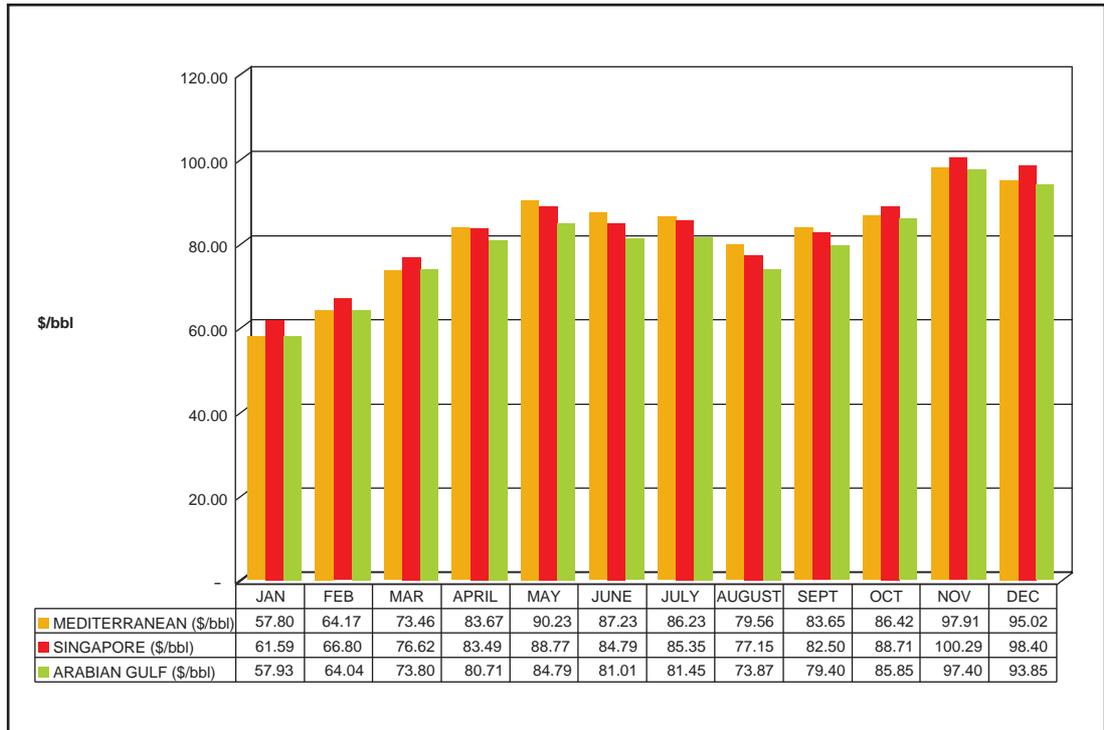
*This cost varies and is dependent on the price of crude on the international market.

To determine the wholesale price of petroleum products, the total cost under line 16 is apportioned amongst the refined petroleum products based on the quantity produced.

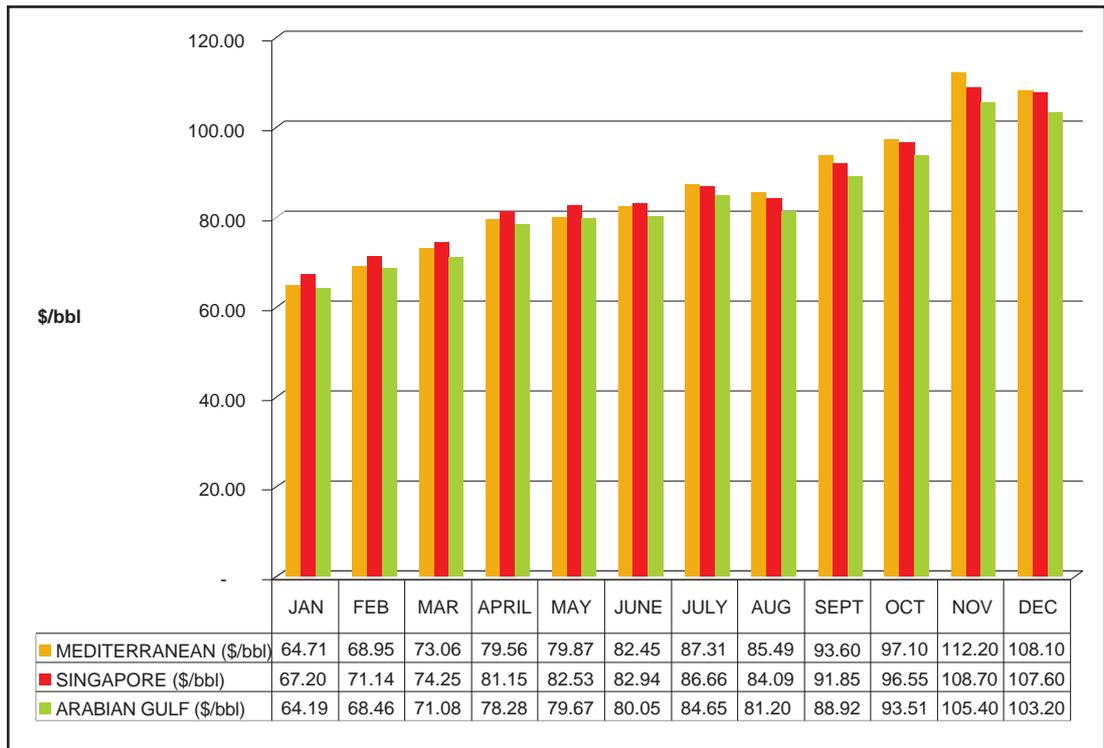
PUMP PRICE BUILD UP			
1	WHOLESALE PRICE TO OMC		a
2	Terminal Fee	K25/litre	b
3	Road Levy	15%	c
4	Excise Duty	45% on Petrol & 15% on Diesel and Kerosene	d
5	Ex Refinery Gate	K/Litre	$e = (a + b + c + d)$
6	Transport Margin	K148/litre	f
7	OMC Margin	K345/litre	g
8	TOTAL (Excl VAT)		$h = (e + f + g)$
9	Dealer Margin	K229/litre	j
10	PRICE TO DEALER		$k = (h + j)$
11	ERB Fees	0.70%	m
12	Strategic Reserves Fund	K/litre	n
13	Price before VAT		$p = (k + m + n)$
14	Value Added Tax (VAT)	17.5%	q
15	BENCHMARK PUMP PRICE	K/litre	$r = (p + q)$



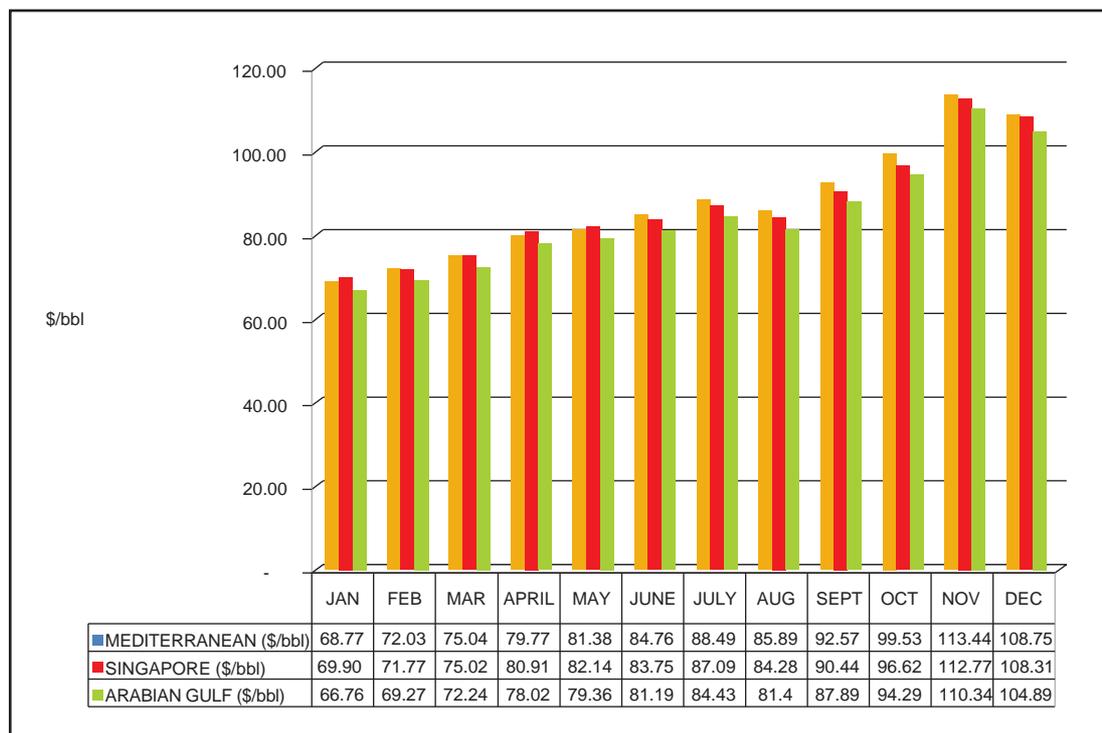
Appendix 5: 2007 Petrol Prices on the International Markets



Appendix 6: 2007 Diesel Prices on the International Markets



Appendix 7: 2007 Jet A1/Kerosene Prices on the International Markets



Appendix 8: 2007 Wholesale Prices

