VISION

A Zambia with universal access to affordable and quality energy products and services

MISSION STATEMENT

To regulate the energy sector in a fair, transparent and predictable manner that safeguards the interests of all stakeholders

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FOREWORD

The unprecedented growth, averaging over 5% per annum, recorded over the last decade is transforming the country that has culminated in the recent reclassification of Zambia as a lower middle income country (from a low income one). Such high growth needs to be underpinned by reliable supply of quality energy products and services so that growth is not curtailed by shortages of energy products and services.

In view of the foregoing, the Energy Regulation Board (ERB) continues to document developments in the energy sector and presents the 2010 Energy Sector Report. This report provides an overview of developments in the electricity, petroleum and renewable energy sub-sectors in Zambia. The 2010 Energy Sector Report covers a lot of developments in the energy sector that range from consumption statistics, tariffs and pricing, investments and other relevant information.

As with other sectors, the energy sector in 2010 continued to experience some challenges arising from energy infrastructure inadequacies and the migration towards ‘cost-reflective’ tariffs that is necessary to underpin increased investments in the Electricity Supply Industry (ESI). Such an increase in tariffs has had significant effects on those industries that are heavily dependent on electricity. Progress, though at a slow rate, was recorded on infrastructure investment with some big power projects expected to be commissioned by 2013.

The petroleum sub sector, on the other hand, has been fairly stable with respect to availability of fuel and the fuel prices. The major event in the sub-sector was the introduction of the national uniform pump pricing mechanism which is discussed in detail in this report.

It is my sincere hope that this edition of the Energy Sector Report will be as value adding to the reader as the previous ones have been.

Butler Sitali
EXECUTIVE DIRECTOR

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<th>Full Form</th>
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<tr>
<td>Bbl</td>
<td>Barrels</td>
</tr>
<tr>
<td>BUTT</td>
<td>Bulk User Transmission Tariff</td>
</tr>
<tr>
<td>BPC</td>
<td>Botswana Power Corporation</td>
</tr>
<tr>
<td>CEC</td>
<td>Copperbelt Energy Corporation</td>
</tr>
<tr>
<td>CNMC</td>
<td>China Non-Ferrous Metals Group Corporation</td>
</tr>
<tr>
<td>CoS</td>
<td>Cost of Service</td>
</tr>
<tr>
<td>DBSA</td>
<td>Development Bank of South Africa</td>
</tr>
<tr>
<td>DFID</td>
<td>Department for International Development (UK development agency)</td>
</tr>
<tr>
<td>EPC</td>
<td>Engineering, Procurement and Construction</td>
</tr>
<tr>
<td>ERB</td>
<td>Energy Regulation Board</td>
</tr>
<tr>
<td>ESI</td>
<td>Electricity Supply Industry</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>GCTC</td>
<td>Grid Code Technical Committee</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GWh</td>
<td>Giga-Watt hour (1,000MWh)</td>
</tr>
<tr>
<td>GRZ</td>
<td>Government of the Republic of Zambia</td>
</tr>
<tr>
<td>HFO</td>
<td>Heavy Fuel Oil</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>KFG</td>
<td>Kafue Gorge</td>
</tr>
<tr>
<td>KNB</td>
<td>Kariba North Bank</td>
</tr>
<tr>
<td>HV</td>
<td>High Voltage</td>
</tr>
<tr>
<td>IPP</td>
<td>Independent Power Producer</td>
</tr>
<tr>
<td>ITC</td>
<td>Independent Transmission Company</td>
</tr>
<tr>
<td>km</td>
<td>kilo metre</td>
</tr>
<tr>
<td>kV</td>
<td>Kilo Volt (1,000 volts)</td>
</tr>
<tr>
<td>kVA</td>
<td>kilo Volt amperes (1,000 amps)</td>
</tr>
<tr>
<td>kW</td>
<td>kilo watt</td>
</tr>
<tr>
<td>kWh</td>
<td>Kilo Watt Hour (1,000 kWh)</td>
</tr>
<tr>
<td>LFO</td>
<td>Light Oil Fuel</td>
</tr>
<tr>
<td>LHPC</td>
<td>Lunsemfwa Hydro Power Company Ltd</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquefied Petroleum Gas</td>
</tr>
<tr>
<td>LV</td>
<td>Low Voltage</td>
</tr>
<tr>
<td>MD</td>
<td>Maximum Demand</td>
</tr>
<tr>
<td>MEWD</td>
<td>Ministry of Energy and Water Development</td>
</tr>
<tr>
<td>MoFNP</td>
<td>Ministry of Finance and National Planning</td>
</tr>
<tr>
<td>MW</td>
<td>Mega Watt</td>
</tr>
<tr>
<td>MWh</td>
<td>Mega watt hour (1,000 kWh)</td>
</tr>
<tr>
<td>MT</td>
<td>Metric Tonne</td>
</tr>
<tr>
<td>MYT</td>
<td>Multi Year Tariff</td>
</tr>
<tr>
<td>M³</td>
<td>Cubic Meter</td>
</tr>
<tr>
<td>MVA</td>
<td>Mega Volt Amperes</td>
</tr>
<tr>
<td>NWEC</td>
<td>North Western Energy Corporation Ltd</td>
</tr>
<tr>
<td>NFT</td>
<td>Ndola Fuel Terminal</td>
</tr>
<tr>
<td>OMC</td>
<td>Oil Marketing Company</td>
</tr>
<tr>
<td>OPEC</td>
<td>Organization for the Petroleum Exporting Countries</td>
</tr>
<tr>
<td>PRP</td>
<td>Power Rehabilitation Project</td>
</tr>
<tr>
<td>REA</td>
<td>Rural Electrification Authority</td>
</tr>
<tr>
<td>RERA</td>
<td>Regional Electricity Regulators Association of Southern Africa</td>
</tr>
<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
</tr>
<tr>
<td>SAPP</td>
<td>Southern African Power Pool</td>
</tr>
<tr>
<td>SPV</td>
<td>Special Purpose Vehicle</td>
</tr>
<tr>
<td>ToU</td>
<td>Time Of Use</td>
</tr>
<tr>
<td>UNIDO</td>
<td>United Nations Industrial Development Organization</td>
</tr>
<tr>
<td>ZAR</td>
<td>South African Rand</td>
</tr>
<tr>
<td>ZESA</td>
<td>Zimbabwe Electricity Supply Authority</td>
</tr>
</tbody>
</table>
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- Zengamina Hydro Power Company;
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- Oil Marketing Companies too many to mention individually;
- TAZAMA Pipelines Ltd;
- INDENI Petroleum Refinery;
- Southern African Power Pool (SAPP);
- Regional Electricity Regulators Association of Southern Africa;
- North-Western Energy Corporation; and the
- Ministry of Energy and Water Development; and
- Others too numerous to mention.
INTRODUCTION

Zambia’s economy continued on its growth path and recorded a GDP growth rate of about 7% in 2010. Electricity and petroleum provided the necessary energy services to fire all the economic sectors of the country.

The electricity sector recovered from the decline which was experienced in 2009 due to the global economic meltdown. Some mines and industries which were placed under care and maintenance in 2009 returned to full operations in 2010. Electricity consumption increased by 7% from 7,279GWh in 2009 to 7,789GWh in 2010. The mines continued being the major consumers of electricity at 47% while industrial/commercial and residential customers accounted for 36% and exports about 7%, respectively, of total electricity produced.

The need for electricity tariffs to reach cost reflective levels continued in 2010. ZESCO applied for an average tariff adjustment of 36% for all customer categories except for mines and exports. After due consideration of the application, the Energy Regulation Board (ERB) awarded the utility an increase of 25.6% with effect from August 2010. On the other hand, ZESCO commenced negotiations with CEC in 2010 for review of the mine tariffs which are expected to be implemented in 2011.

The national consumption of petroleum products continued to increase on account of increased economic activities. In 2010, consumption increased by 6.7% to 753,652 MT from 706,232 MT in 2009. The total consumption in 2010 of Low Sulphur Diesel (LSD), Diesel, Unleaded Petrol (ULP) and Kerosene increased by 24.6%, 8.2%, 5.6% and 11.3%, respectively. However, consumption of Heavy Fuel Oil (HFO), Liquified Petroleum Gas (LPG), Avgas and Jet-A1 declined by 22.0%, 11.9%, 12.4% and 1.8%, respectively.

This 2010 Energy Sector Report highlights the performance and developments in the energy sub-sectors of electricity, petroleum and other forms of energy. It concludes by providing insights into the prospects for 2011 and beyond.
1.0 DEVELOPMENTS IN THE ELECTRICITY SUPPLY INDUSTRY

1.1 ELECTRICITY GENERATION IN 2010

1.1.1 Generation from Major Hydro Power Stations

Total generation from the major hydro power stations in 2010 increased by 8.6% from 10,138 GWh in 2009 to 11,007 GWh. The individual power plants’ performance varied with Kafue Gorge recording increased generation of 15.1% in 2010 over 2009 figures. Kariba North Bank power station recorded a 2.4% reduction in generation in 2010 compared to generation in 2009, while Victoria Falls power station recorded a marginal increase of 0.8% in 2010. A four year generation trend from major hydro power plants is shown in Figure 1.

FIGURE 1: GENERATION FROM MAJOR HYDRO STATIONS

The installed capacity for Kafue Gorge is 990MW, Kariba North Bank is 720MW and Victoria Falls is 108MW.

1.1.2 Generation from Mini Hydro Power Stations

Generation from mini-hydro power stations in 2010 increased by 2.3% from 2009. Lunzua and Lusiwasi recorded increased generation by 28% and 8.1% respectively. Chishimba and Musonda Falls power stations on the other hand recorded reductions in generation of 5.1% and 5.2% respectively. Figure 2 shows performance in the past 4 years.

1 For installed capacities for mini-hydro stations, refer to section 3.4
1.1.3 Generation from Diesel Stations

Total generation from diesel power stations increased by 12.2% from 12,621 MWh in 2009 to 14,155 MWh in 2010. Six out of eight diesel power stations recorded increased generation in 2010 compared to 2009 generation. The highest increase was for Mufumbwe at 62.3%, followed by Kabompo at 38.5%; Chavuma at 34.2%; Kaputa at 21.4%; Lukulu at 10.4%; and Mwinilunga at 2.4%. The main reason for the increased generation is the deployment of newer and bigger diesel generation machines at some of the stations. However, Zambezi and Luangwa stations recorded reductions in generation of 17.9% and 0.4%, respectively. Zambezi faced operational constraints of fuel supply and machinery break downs.

Figure 3 shows the trend in generation from Diesel stations for the past 4 years.

---

2 Chama Diesel Power Station was decommissioned in 2007 after the town was connected to the Malawi grid.
1.2 ELECTRICITY CONSUMPTION BY SECTOR

The economic activities that slowed down in 2009 in the wake of the global financial crisis saw a major revival in 2010. In 2010, total power consumption by all economic sectors increased by 7% from 7,279 GWh in 2009 to 7,789 GWh in 2010. This positive development is a reflection of the increase in economic activities particularly in the mining, agriculture, services, construction and other sectors. The agricultural sector recorded the biggest increase of 14.9%, followed by the construction sector at 10.2%, mining sector at 9.6% and services sector at 7.3% in 2010. The four (4) sectors of agriculture, mining, manufacturing and construction accounted for the highest contribution to the 7.1% growth to GDP in 2010.3

On the other hand, the ‘others’ and manufacturing sectors recorded reductions of 4.3% and 3.2% respectively in power consumption in 2010 compared to 2009.

In terms of the share of total power consumption, the mining sector still remains the largest power consuming sector at 46.9%, followed by the services sector which includes the residential consumers at 35.5%, manufacturing at 5.4%, finance and property at 4.3%, agriculture at 2.49% and construction sector at 0.12% of total consumption. Table 1 shows the consumption by economic sector.

### TABLE 1: CONSUMPTION BY ECONOMIC SECTOR 2008 - 2010

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>UNITS CONSUMED kWh</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2008-2009</th>
<th>2009-2010</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>166,421</td>
<td>168,687</td>
<td>193,786</td>
<td>2.3%</td>
<td>2.3%</td>
<td>2.5%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Construction</td>
<td>6,531</td>
<td>8,411</td>
<td>9,265</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>28.8%</td>
</tr>
<tr>
<td>Energy &amp; water</td>
<td>72,180</td>
<td>89,169</td>
<td>90,645</td>
<td>1.0%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Finance &amp; Property</td>
<td>259,376</td>
<td>343,490</td>
<td>338,108</td>
<td>3.5%</td>
<td>4.7%</td>
<td>4.3%</td>
<td>32.4%</td>
</tr>
<tr>
<td>Others</td>
<td>165,127</td>
<td>144,813</td>
<td>138,527</td>
<td>2.3%</td>
<td>2.0%</td>
<td>1.8%</td>
<td>(12.3%)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>482,774</td>
<td>432,612</td>
<td>418,807</td>
<td>6.6%</td>
<td>5.9%</td>
<td>5.4%</td>
<td>(10.4%)</td>
</tr>
<tr>
<td>Mining</td>
<td>3,980,662</td>
<td>3,338,749</td>
<td>3,658,113</td>
<td>54.3%</td>
<td>45.9%</td>
<td>47.0%</td>
<td>(16.1%)</td>
</tr>
<tr>
<td>Services</td>
<td>2,021,850</td>
<td>2,580,051</td>
<td>2,768,227</td>
<td>27.6%</td>
<td>35.4%</td>
<td>35.5%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Trade</td>
<td>159,383</td>
<td>153,459</td>
<td>151,894</td>
<td>2.2%</td>
<td>2.1%</td>
<td>2.0%</td>
<td>(3.7%)</td>
</tr>
<tr>
<td>Transport</td>
<td>18,024</td>
<td>19,870</td>
<td>21,470</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Total</td>
<td>7,332,328</td>
<td>7,279,311</td>
<td>7,788,843</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>(0.70%)</td>
</tr>
</tbody>
</table>

**SOURCE:** ZESCO 2010 STATISTICS

1.3 ELECTRICITY IMPORTS AND EXPORTS IN 2010

In 2010, ZESCO recorded a slight reduction of 2% in electricity exports compared to a major increase of 515% in 2009. With regards to imports, ZESCO recorded an increase of 30% in electricity imports in 2010 compared to a marked reduction of 96% in 2009. The increase is attributed to exports to Namibia following the commissioning of the 220 kV transmission line between Victoria Falls and Katima Mulilo (Namibia) via Sesheke.


**TABLE 2: ELECTRICITY IMPORTS AND EXPORTS 2006 – 2010 (MWh)**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>% CHANGE 2009-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>552,283</td>
<td>416,720</td>
<td>95,843</td>
<td>589,078</td>
<td>578,040</td>
<td>(2%)</td>
</tr>
<tr>
<td>Imports</td>
<td>45,609</td>
<td>274,828</td>
<td>263,706</td>
<td>9,877</td>
<td>12,870</td>
<td>30%</td>
</tr>
</tbody>
</table>

SOURCE: ZESCO 2010 STATISTICS

---

**2.0 ZESCO PERFORMANCE**

**2.1 KEY PERFORMANCE INDICATORS**

In order to enhance ZESCO’s efficiency, the ERB in 2007 adopted a Multi-Year Tariff Framework (MYTF) that is based on the use of self-enforcing incentives that are embedded in the tariff determination process. Incentives in the form of Key Performance Indicators (KPIs) were incorporated to motivate ZESCO improve performance and delivery of quality service to its customers.

The ERB has been monitoring ZESCO’s KPIs scores since January 2008. However, in June 2009, the ERB gave ZESCO a consolidation period up to March 2011 in which it was required to put the necessary measures in place towards achieving the KPIs. This meant that the KPIs would not have a bearing on the tariffs awarded in the period until 1st April 2011.

ZESCO’s performance on the KPIs in 2010 was as follows:

**2.1.1 Metering**

**Metering new connections**

For the period January to December 2010, ZESCO connected a total of 34,881 new customers, compared to 23,459 and 34,825 in 2008 and 2009 respectively. Of these new connections, 11,321 (32%) were metered. The remaining 23,560 customers were added to the existing backlog of unmetered customers.

**Connection time**

ZESCO was required to reduce to 30 days the average time it takes to connect customers once they have fully paid connection charges by March 2011. ZESCO reduced its actual connection time by 38 days, from a high of 64 days at the beginning of 2010 to 26 days in December 2010. With connection time standing at 26 days, ZESCO has met the KPI target to reduce connection time.

**Metering the unmetered customers**

ZESCO metered a total of 47,444 unmetered customers in 2010, against a target of 42,239. In 2008 and 2009, ZESCO metered 27,030 and 91,628 unmetered customers respectively. Despite meeting the KPI target in 2009 and 2010, the backlog of unmetered customers as at December 2010 remained high at 103,662 on account of ZESCO’s inability to meter all newly connected customers that were consequently added to the backlog of unmetered customers. As at December 2010, ZESCO’s customer base stood at 411,117.
2.1.2 Cash Management

**Total receivables**
ZESCO was required to reduce total receivables to 17% of total turnover by March 2011. The utility's total receivables stood at K1,081 billion (63% of total turnover) in January 2010 and were required to reduce by 9.2% during the year. Total receivables declined by 25% ending the year at 42% of total turnover.

**Trade receivables**
Trade receivables are expected to reduce to not more than 17% of trade turnover by March 2011. This translates into an annual reduction of 8.2% per annum. Actual trade receivables stood at K577 billion (36% of trade turnover) at the beginning of January 2010 and declined by 6.5% to 29% by the end of December 2010.

**Debtor days**
ZESCO is expected to reduce debtor days to 60 days by March 2011. The utility’s debtor days reduced by 24 days from 130 days at the beginning of January to 106 days in December 2010.

2.1.3 Staff productivity

ZESCO is expected to attain a customer to employee ratio of 100:1 by March 2011. ZESCO’s ratio improved to 95:1 in 2010 from 89:1 in 2009. This is attributable to the increase in the utility’s customer base which increased to 411,117 in December 2010.

2.1.4 Quality of service supply

Annual unplanned outages (excluding outages due to load shedding) were required to reduce by 15.8 hours per customer in 2010. ZESCO reduced annual unplanned outages by 26.5 hours during the year, from 50.1 hours at the beginning of January to 23.6 hours in December 2010. Despite the good performance during the year, ZESCO’s overall performance remained above the 5 hours target per customer on account of poor performance in 2008 and 2009.

2.1.5 System losses

**Transmission losses**
ZESCO was expected to maintain transmission losses at 3.0% or less during the year. Transmission losses averaged 5.5% between January and December 2010, hitting a high of 9.9% in July and a low of 3.3% in October 2010.

**Distribution losses**
Distribution losses were required to decline to 14% by March 2011. Losses stood at 20% in January and declined to 8% in December 2010. With this performance in 2010, ZESCO has fully met the requirement of this KPI.

### 3.0 STATUS OF THE ZESCO POWER REHABILITATION PROJECT

3.1 VICTORIA FALLS POWER STATION

Rehabilitation works at the power station were completed in 2009. However, one 10MW generator was damaged during the final commissioning works. The generator was repaired and commissioned in November 2010.

3.2 KAFUE GORGE POWER STATION

Rehabilitation and up-rating works at the station were completed in March 2009 and the total installed
capacity has increased from 900MW to 990MW. During 2010, the station had operational challenges with the newly installed transformers. The problem with the transformers has not yet been rectified as ZESCO is still trying to sort it out with the supplier.

3.3 KARIBA NORTH BANK

The rehabilitation works at the station involved the refurbishment and up-rating of the four machines from 150MW to 180MW. To-date, three machines have been up-rated. Work on the last generator was delayed due to the fire that broke out at the power station in September 2009. However, no work was done on this generator in 2010, but ZESCO expects to complete works on the machine in 2011.

3.4 REHABILITATION OF MINI-HYDRO STATIONS

In 2009, ZESCO entered into a contract with a consultant (Scott Wilson) to assess the rehabilitation and up-rating requirements and prepare tender documents for a number of the mini-hydro stations. The following stations were earmarked for rehabilitation and possible up-rating:

i. Chishimba Falls Hydro Station
The station is rated at 6MW but currently generates a maximum of 4MW. During 2010, the consultant was still conducting surveys on the station.

ii. Lunzua Hydropower Station
The station is rated at 0.75MW and currently generates a maximum of 0.6MW. Works planned for the station include the construction of a new 15.3MW plant. During 2010, the consultant completed hydrological investigations, topographical surveys and geological investigations. Consequently, a tender for the development of the 15.3MW station was issued and a contract awarded to China National Electric Equipment Corporation (CNEEC).

iii. Lusiwasi Hydropower Station
The station has an installed capacity of 12MW but generates a maximum of 9.5MW. In 2010, the consultant submitted a draft rehabilitation and uprating study report that recommended the construction of a new 86MW plant to replace the existing 12MW plant. According to the report, the proposed plant is the most optimal investment that will provide the best financial return for the development of the power station.

iv. Musonda Falls Station
The station has an installed capacity of 5MW and currently generates a maximum of 4MW. In December 2010, the consultant in collaboration with ZESCO completed the hydrographic survey of the power station.

4.0 PERFORMANCE OF OTHER UTILITIES

4.1 COPPERBELT ENERGY CORPORATION PLC

The Copperbelt Energy Corporation (CEC) owns and operates high-voltage transmission and distribution systems. CEC supplies electricity to Zambia’s mining companies on the Copperbelt which accounts for about 40% of the country’s consumption. Since 2007, the company has also been supplying power to a mine based in the Democratic Republic of Congo (DRC).

Operations
The mining sector recovered from the global economic downturn experienced in 2009. In 2010, CEC posted an 8% increase in capacity sales from an average of 436MW to an average of 470MW. The positive growth is attributable to the resumption of operations at one of the mines placed under care and maintenance during the downturn and also a return to full production and expansion projects by
some mines as copper prices rebounded during the year.

Status of the Planned Generation and Transmission Projects

a) **Muliashi Project**
   CEC is expanding its transmission network in the Luanshya area to supply the Muliashi mining operations which are an expansion to the operations of CNMC Luanshya Copper Mines. A Total of 10km of 66kV transmission lines and a new 66/11kV 90MVA substation will be constructed in Luanshya. The project commenced in 2010 and is expected to be completed by the end of 2011.

b) **Konnoco Project**
   The Konnoco Project is a joint partnership between Vale of Brazil and ARM of South Africa. The project involves the development of a new mining operation at an old mining site in the Konkola area of Chililabombwe. To supply power to this mine, CEC will construct a new 66/11kV 60MVA substation at the Konnoco mine site. CEC will also extend its 66kV transmission line by 9km to service the area that is currently serviced by an 11kV line of the same length. The project commenced towards the end of 2010 and is expected to be completed by end of 2011.

c) **Chingola Refractory Ore and Concentrator Projects**
   Konkola Copper Mines (KCM) in Chingola are expanding their processes in a project called the Chingola Refractory Ore and Concentrator project. CEC will reinforce the already existing assets to transmit an additional 65MW power needed for the project.

d) **Zambia – DRC Interconnector Project**
   CEC will upgrade its Interconnector capacity to the DRC by constructing a double circuit 220kV transmission line 54km long to the DRC border with a capacity of 520MW. This will assist to transmit from the DRC to the SADC corridor. In addition, CEC will further reinforce its substations at Luano and Michelo to handle the increased power transmission.

   The timing of the project will be synchronised to the counterpart project in the DRC and is likely to commence in the later part of 2011.

**Challenges faced by CEC**

Dependence on the mining and the need to diversify the business still remains the biggest challenge for the organisation. This coupled with the ever increasing short fall in the hydropower generation capacity in Zambia and the region, are the greatest challenges to the organisation.

Consequently, CEC has developed a business diversification strategy aimed at addressing these industry wide challenges and this strategy includes CEC’s involvement in hydropower generation projects.

**4.2 Lunsemfwa Hydro Power Company Ltd**

Lunsemfwa Hydro Power Company (LHPC) has an installed capacity of 49MW comprising of two plants at Mulungushi and Lunsemfwa Power Stations with 31MW and 18MW respectively. The company delivered a total of 390GWh in 2010 up by about 23% from 318GWh in 2009.

Status of the planned generation and transmission projects

a) The project to install an additional 6MW machine at Lunsemfwa Power Station and the Station upgrade started in 2010 and is expected to be commissioned in March 2012.

b) The Environmental Impact Assessment (EIA) Study for the transmission line from Lunsemfwa Power Station to Mkushi Mine JV was completed and approved by the Environmental Council.
of Zambia (ECZ) in 2010. The Project implementation awaits finalization of the Mining Project by the developer for Mkushi Mine JV. LHPC will be the transmission line implementation agent.

c) LHPC formed a Special Purpose Vehicle (Muchinga Power Company) with InfraCo (UK) to develop the Lunsemfwa Lower/Mkushi River hydro power project. The feasibility studies commenced during the year with the engagement of the technical consultant and the Environmental and Social Impact Assessment (ESIA) consultant in September 2010 and December 2010, respectively. The project is expected to be completed by 2016 and will generate between 180 – 220 MW.

Challenges faced by LHPC

LHPC has continued facing the same challenges as in 2009. These include the delay in implementing the Open Access Grid Code and competing needs of water resources with farmers on the Lunsemfwa River.

4.3 ZENGAMINA POWER COMPANY LIMITED

Zengamina Power Company Ltd (ZPC) is an off-grid power generation and supply company situated in North Western Province with an installed capacity of 750kW. The company commenced initial operations in October 2008 with full commercial operations starting in April 2009.

Customer Profile

In 2010, ZPC had a total of 250 customers compared to 165 customers in 2009 representing an increase of 52%. As was the case in 2009, residential metered customers still make up the largest customer group followed by the no-meter residential customer category. The company has introduced a new customer category for small businesses with only one customer in 2010.

**TABLE 3: ZENGAMINA CUSTOMER PROFILE 2009 - 2010**

<table>
<thead>
<tr>
<th>CUSTOMER CATEGORY</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO. OF CUSTOMERS</td>
<td>%</td>
</tr>
<tr>
<td>Community service</td>
<td>3</td>
<td>1.8%</td>
</tr>
<tr>
<td>No Meter (Residential)</td>
<td>51</td>
<td>30.9%</td>
</tr>
<tr>
<td>Metered (Residential)</td>
<td>101</td>
<td>61.2%</td>
</tr>
<tr>
<td>Standard Commercial</td>
<td>10</td>
<td>6.1%</td>
</tr>
<tr>
<td>Small Business</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>165</td>
<td>100%</td>
</tr>
</tbody>
</table>

SOURCE: ZENGAMINA POWER COMPANY

Operations of ZPC

In the year 2010, ZPC supplied about 1,380 MWh of energy to its various customers. Figure 4 shows the profile of energy supplied.
Challenges faced by ZPC

ZPC has been facing similar challenges since inception. The company is still not able to meet its operating costs from sales given the small customer base in the rural area coupled with the limited economic activity. As such, the company does not have adequate resources to finance necessary capital projects and employ qualified staff.

Further, ZPC customers continue to complain about the higher tariffs charged compared to those charged by ZESCO elsewhere in the country. On the technical side, the system is not adequately protected, therefore prone to lightning resulting in the interruption of power supply to the area during rainy seasons.

Future investments

The Zambian Government through the Rural Electrification Authority (REA) received funding from the World Bank to increase access to electricity services. The program commenced with preliminary works to carry out feasibility studies and detailed engineering designs of two (2) mini-hydros in Northwestern province. One of these projects is the 750 kW Zengamina 2, which is the second phase of the recently built 750 kW Zengamina project in Mwinilunga.

The REA will hire consultants for the work under the World Bank-funded program to increase access to electricity services. The consultants are expected to carry out feasibility studies and detailed engineering design. They are also expected to assess the projects and, if they are determined feasible, produce detailed engineering drawings and bid documents, as well as assist in bid evaluation. There is also potential, under later contracts, for the consultants to supervise civil works, supply, installation, testing, and commissioning of the project.

4.4 NORTH WESTERN ENERGY CORPORATION

The North Western Energy Corporation (NWEC) Limited is engaged in the distribution and supply of electricity. It was incorporated in June 2007 and currently supplies power to the Lumwana Mining housing complex\(^4\).

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\(^4\) The management of the housing complex is under Lumwana Property Development Company (LPDC), a wholly owned subsidiary of Lumwana Mining Corporation (LMC).
NWEC had 368 customers in January 2010 that increased to 745 in December 2010. The company’s maximum demand increased from 1.20MVA in January to 1.59MVA in December 2010. In 2010, NWEC electricity energy purchases from ZESCO increased by 37% from 6.3 GWh in 2009 to 8.6 GWh in 2010. All customers are residential except for Lumwana Property Development Company (LPDC), that is the only bulk customer.

5.0 PLANNED INVESTMENTS IN THE ELECTRICITY SECTOR IN 2011

5.1 ITEZHI TEZHI HYDRO POWER PROJECT

Itezhi-Tezhi Power Corporation Limited (ITPC) is a Special Purpose Vehicle (SPV) between ZESCO and TATA of India (TATA) for the development of the Itezhi-Tezhi Power Project. ZESCO and Tata have an equal shareholding in the company.

The 120 MW power station is being developed on the model of Build, Own, Operate and Transfer (BOOT) basis and will be transferred to ZESCO after 25 years of operation.

The project was originally planned to start in early 2010, but will now commence in 2011 on account of delays in reaching financial closure.

The total cost of the Project is estimated at US$230 million. The project is a brown field investment that will benefit from the use of an existing dam and a reservoir infrastructure. The dam and the associated facilities are being leased from ZESCO for the duration of the project.

5.2 KARIBA NORTH BANK POWER STATION EXTENSION

The Kariba North Bank Extension Power Company (KNBEPIC) is an SPV wholly owned by ZESCO. The project will increase the existing capacity of the power station by constructing a 360MW peaking plant expected to operate for an average of 3.5 hours per day.

The total cost of the project is US$420 million to be financed by loans of US$315 million from China Export Import Bank (CEIB) to ZESCO and US$105 million from Development Bank of Southern Africa (DBSA) lent directly to KNBEPIC.

Civil works at the station commenced with 65% of the excavations completed by the end of 2010. Construction of the plant is expected to be completed in December 2012 with operations commencing in January 2013.

5.3 KAFUE GORGE LOWER POWER STATION

In August 2010, the Government of Zambia and the Government of the Peoples’ Republic of China signed a Memorandum of Understanding to develop the Kafue Gorge Lower Hydroelectric Project.

The 750MW power plant is expected to cost about US$1.5 billion (excluding financing costs) and is being executed through an SPV owned by Sinohydro, China Africa Development Fund (CADFund) and ZESCO Ltd on a Build Operate and Transfer (BOT) basis. The project shareholding split is 30% for ZESCO and 70% for Sinohydro/CADFund. The plant will be transferred to ZESCO after 30 years.

The plant is designed as a base load station with an initial installed capacity of 600MW (4X150MW machines) with provision for an extra bay of 150MW machine for future expansion.

Works on the access road and camp site are expected to commence in 2011 while actual construction works at the power plant will commence in 2012.
5.4 SHIWANG’ANDU MINI HYDRO POWER PROJECT

Shiwang’andu mini-hydro is a GRZ/UNIDO coordinated project which ZESCO is expected to develop. The mini-hydro plant will be rated at 1MW. The total project cost is estimated at US$ 4.15 million and ZESCO is expected to contribute US$ 3.59 million.

The contractor, IC-SHP of China set up temporary site accommodation and offices in May 2010 and the 4km access road has since been graded in readiness for the contractor’s mobilization.

5.5 CEC KABOMPO PROJECT

CEC is developing the Kabompo hydro power project on the Kabompo River in North Western Province. The company will develop the plant and the associated transmission line on a Build Own and Operate (BOO) basis.

A feasibility study was completed in June 2010 for the 40MW underground power plant. Project construction will take 4 years at an approximate cost of US$150 million and is earmarked to be completed in 2015.

Power from Kabompo is intended to be introduced in the CEC system to supplement power from ZESCO. The plant may also be used to operate as a peaking plant in addition to the existing CEC 80MW Gas Turbine Alternators (GTAs). This will be more cost effective and reduce load shedding as the country’s demand continues to increase.

The main activities to be undertaken in 2011 on the project include project structuring & finance sourcing, environmental reviews and resettlement activities, transmission line planning, Engineering, Procurement and Construction (EPC) tender preparations and site preparation.

The challenges faced by the project include:
- The main 32km access road is in very bad state and requires rehabilitation; and
- Construction of power line is required before the start of the project as there is no electricity near the project.

5.6 NDOLA HEAVY FUEL OIL THERMAL POWER PLANT PROJECT

The Government of the Republic of Zambia (GRZ) in 2010 initiated a project to construct a 50 MW Heavy Fuel Oil (HFO) Plant in Ndola. The Concordia Energy Group of Mauritius through its subsidiary, the Ndola Energy Company Limited (NEC) will build and operate the plant and ZESCO will be the off taker of the power.

The project will be situated adjacent to Indeni Refinery and will utilize HFO from the refinery. The plant will operate as a base load plant. Construction works are expected to begin in 2011 and will take about 9 months to complete.

The proximity of the generating plant near the major load centre would assist in improving voltage profiles and the stability of the general electrical network on the copperbelt. This would also be useful since most industries take power at either the 33 KV or 66KV network.

5.7 SYNCLINORIUM PROJECT

Mopani Copper Mines (MCM) in Kitwe are developing a new mine shaft. Consequently, CEC will reinforce Nkana substation by 60MVA to meet the additional power demand by the new shaft. Plans for the project have reached an advanced stage and implementation is likely to commence by the third quarter of 2011.

5.8 ZAMBIA – DRC INTERCONNECTOR PROJECT

To address the power shortages in the SADC region, the World Bank are financing generation and
transmission projects (new and refurbishments) in the Democratic Republic of Congo (DRC). To transmit this power to the SADC corridor, CEC will upgrade its Interconnector capacity to the DRC by constructing a double circuit 54km 220kV transmission line to the DRC border with a capacity of 520MW. In addition, CEC will further reinforce its substations at Luano and Michelo to handle the increased power transmission.

6.0 TARIFF REVIEWS IN 2010

6.1 ZESCO

Following the Cost of Service (CoS) study of 2007, the ERB commenced electricity tariff migration towards cost reflective levels. In the tariff decision of 2009, the ERB suspended the use of KPIs to determine ZESCO tariffs up to March 2011. This was done to allow the utility to consolidate its financial position and generate adequate revenues to operate successfully as a commercial entity.

ZESCO in its application cited the following as reasons necessitating an increase in tariffs:

i. Changes in the economic conditions over the previous two years;

ii. Changes in the cost of generating, transmitting, distributing and supplying electricity;

iii. The need for system and customer base expansion; and

iv. The rising cost of electricity imports.

As part of the public consultation process for the tariff review, 46 submissions were received from electricity consumers from various parts of the country.

Although most submissions opposed the tariff increases citing various reasons, a few customers supported the proposed increases stating that the tariffs were below cost thereby putting a financial strain on the utility.

In considering the tariff application, the ERB reviewed the application in line with the following regulatory principles:

i. Recovery of prudently incurred costs by the Utility;

ii. Recognition of used and useful Utility assets only;

iii. Financial sustainability of the Utility;

iv. The need to attain cost reflective tariffs;

v. Delivery of quality service; and

vi. Social considerations for the indigent customers.

Taking into account the above tariff determination principles, the utility’s justification for the application and the consumers’ submissions, the ERB approved the increases shown in Table 4:

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5 This excludes customers on power purchase agreements such as the mines and export customers.
TABLE 4: PROPOSED AND APPROVED TARIFFS IN THE 2010 REVIEW

<table>
<thead>
<tr>
<th>CUSTOMER CATEGORY</th>
<th>ZESCO PROPOSED K/kWh</th>
<th>% INCREASE</th>
<th>ERB APPROVED K/kWh</th>
<th>% INCREASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>445.02</td>
<td>69</td>
<td>373.09</td>
<td>41</td>
</tr>
<tr>
<td>Large Power (MD3 &amp; MD4)</td>
<td>304.01</td>
<td>6</td>
<td>320.54</td>
<td>12</td>
</tr>
<tr>
<td>Small Power (MD1 &amp; MD2)</td>
<td>278.06</td>
<td>14</td>
<td>280.23</td>
<td>15</td>
</tr>
<tr>
<td>Commercial</td>
<td>376.38</td>
<td>41</td>
<td>338.44</td>
<td>27</td>
</tr>
<tr>
<td>Services</td>
<td>284.10</td>
<td>49</td>
<td>254.10</td>
<td>33</td>
</tr>
<tr>
<td>Simple Average</td>
<td>337.51</td>
<td>36</td>
<td>313.29</td>
<td>25.60</td>
</tr>
</tbody>
</table>

In its ruling on the application, the ERB made the following observations:

i. That the variation of tariffs in itself was not the only solution to ZESCO’s operational challenges, the utility needed to re-engineer its internal business processes and transform itself into a fully fledged commercial entity;

ii. That the turn-out of submitters at the public hearings was poor and disappointing when compared to the number of submissions received. Only 20 out of the 46 people who had made written submissions turned up at the hearings to articulate their positions;

iii. That ZESCO should consider implementing load shaving as an alternative to load shedding through the use of specific appliances such as ripple switches for geysers;

iv. That ZESCO’s quality of service has generally deteriorated as indicated by the utility’s 2009 KPI scores;

v. That ZESCO had not yet shifted its staff tariff to the regular residential tariffs, contrary to the ERB’s earlier directives; and

vi. That the power rehabilitation project has experienced delays in completion and the utility is facing post rehabilitation challenges on the projects.

On ZESCO’s operational and financial position, the ERB had the following findings:

i. That the utility should urgently deal with the current electricity supply constraints and accelerate new power projects with the help of the Government;

ii. That ZESCO was under-capitalised and the Government, being the sole owner should consider recapitalizing the utility;

iii. That ZESCO staff costs in relation to its total operating costs were still high at 51% of total costs. The international industry standard was about 30%;

iv. That ZESCO’s trade receivables were still high. The Government should liquidate the debt that it owes ZESCO, while the utility should accelerate the installation of pre-paid meters at all Government institutions and should be proactive in its debt collection;

v. That the utility’s performance against the agreed KPIs was unsatisfactory;

vi. That there was a negative public perception of ZESCO which the utility needed to seriously address; and

vii. That it was imperative that electricity tariffs in Zambia are cost reflective to encourage more investment in the energy sector especially in light of the prevailing power deficit.
Finally, the ERB stated that cost reflective tariffs were necessary to promote efficient use of electricity which is key to demand side management.

**ZESCO’s Electricity Tariff migration path**

Since the commencement of the current tariff migration path in 2008, the ERB has so far reviewed 3 consecutive annual tariff applications. The reviews have resulted in cumulative tariff increases of about 88% as shown in Table 5. The residential consumer tariffs have registered the highest increase followed by large power, services, small power and commercial customers, respectively.

**TABLE 5: APPROVED TARIFF INCREASES: 2008 - 2010**

<table>
<thead>
<tr>
<th>CUSTOMER CATEGORY</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>CUMULATIVE INCREASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDENTIAL</td>
<td>27.8%</td>
<td>40%</td>
<td>41%</td>
<td>108.8%</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>1.3%</td>
<td>27%</td>
<td>27%</td>
<td>55.3%</td>
</tr>
<tr>
<td>SERVICES</td>
<td>6.8%</td>
<td>25%</td>
<td>33%</td>
<td>64.8%</td>
</tr>
<tr>
<td>SMALL POWER (MD1 &amp; MD2)</td>
<td>16.2%</td>
<td>26%</td>
<td>15%</td>
<td>57.2%</td>
</tr>
<tr>
<td>LARGE POWER (MD3 &amp; MD4)</td>
<td>27.5%</td>
<td>42%</td>
<td>12%</td>
<td>81.5%</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>27%</td>
<td>35%</td>
<td>25.60%</td>
<td>87.6%</td>
</tr>
</tbody>
</table>

**SOURCE: ERB**

6.2 NWEC

In January 2010, NWEC applied to the ERB for approval of a residential tariff of K475/kWh (USc 9.5/kWh). This was the first formal tariff application from NWEC since it was granted a licence to operate in 2008.

In its application, NWEC stated that the tariff applied for was not adequate to cover its full costs (i.e. operational and capital). The design of NWEC is to supply a small market of about 1,000 households which necessitated Lumwana Mine Corporation (LMC) to pay the former a maintenance fee (effectively a subsidy) in order to meet NWEC’s costs. As such, the tariff of USc 9.5/kWh NWEC applied for was basically to cover the cost of purchasing electricity from ZESCO at USc 4.5/kWh and also to finance part of the capital cost of the project, which was US$3.8 million.

During the tariff review process, a total of 11 submissions were received and subsequently a public hearing was held in the Lumwana township in March 2010. In its tariff decision, the ERB took into consideration the need for NWEC to charge just and reasonable tariffs so as to ensure the utility raises sufficient revenue to meet its operational and capital expenditures, while ensuring that consumers are not disadvantaged.

In May 2010, the ERB concluded its review of the NWEC tariff application and approved a residential tariff of K285.6/kWh (USc 6/kWh). NWEC contested the ERB’s decision in court as it felt that the ERB had unjustly approved a lower tariff than applied for. By December 2010, the matter was still before the courts.
7.0 OTHER DEVELOPMENTS IN THE ESI IN 2010

7.1 RURAL ELECTRIFICATION

The Rural Electrification Authority (REA) continued implementing its main mandate of providing electricity infrastructure to rural communities as mandated by the Government.

**Rural Electrification Master Plan**

The Government, through its Vision 2030, would like to increase access to electricity from the current levels of 3% to 51% in the rural areas by 2030. The Rural Electrification Master Plan (REMP), that is a blueprint for rural electrification for the period 2008 – 2030, was launched in April 2010 by the Government. The master plan is expected to improve the execution of rural electrification projects in a systematic and efficient manner. The REMP consists of electrification targets, ranking, methods, time schedules and budget requirements up to 2030. The plan has identified 1,217 Growth Centres in rural areas at a total cost of K6 trillion (US$1.1 billion) for the period 2008 to 2030, translating into an annual expenditure of about K250 billion (US$50 million). REA still faces funding challenges to meet target requirements in the REMP.

**Connection Subsidies Agreement**

In December 2010, the Government and the World Bank signed a Connection Subsidies Framework Agreement. This additional Financing Agreement of US$10 million will be used to subsidise connection fees for approximately 30,000 new households. This facility is part of the Increased Access to Electricity Services (IAES) Project of US$75.5 million which the Government signed with a consortium of donors (led by World Bank) in February 2009. The IAES project is expected to be completed by December 2013.

**REA Operations**

REA electrifies rural areas through grid extension, solar energy and stand alone electricity systems supplied from renewable sources such as mini-hydro power stations and biomass generation. As part of grid extension, REA issued four projects to private contractors in 2010 to commence construction. The four project sites were: Sanjongo in Chavuma District; Kanyanja and Mtowe in Chipata District; and Shantumbu in Kafue District. The projects are expected to be completed in 2011.

Under the solar energy component, 7 solar home systems were installed in various schools and health centres in rural areas. With regard to mini-hydro development projects, there was no project implementation but studies and designs for 5 sites were approved in 2010. The sites were Chilinga (Nyimba District), Mumbotuta (Milenge), Chikata (Kabompo), Mujira (Mwinilunga), Chavuma and Chanda Falls (Chavuma).

7.2 REGIONAL DEVELOPMENTS IN SAPP

**Power shortages**

In 2010, the Southern Africa Development Community (SADC) region continued to experience inadequate power supplies especially during peak hours. With average annual regional electricity demand growth of about 4.6% per annum, it is imperative to accelerate power project execution. In this regard, SADC is facilitating the fast tracking of regional projects that span generation, transmission and distribution to cope with rising power demand. Some of the priority regional projects are as follows:

**ZIZABONA Transmission Project**

In 2010, the implementation of the ZIZABONA project progressed with the commissioning of the ZAR3.2 billion Caprivi Link Interconnector that connects the Namibian grid to the Zambian and Zimbabwean grids.
The project will involve the following:

- Construction of 330 kV line between Hwange substation and a switching station at Victoria Falls Town in Zimbabwe;
- construction of 14 km 330 kV line between the switching station at Victoria Falls Town and Livingstone in Zambia;
- Strengthening transmission infrastructure in Zimbabwe and Zambia;
- Construction of a transmission line to link Pandamatenga in Botswana to the Zambezi substation in Namibia’s north-eastern Caprivi region; and
- Strengthening of transmission lines between Zimbabwe, Botswana and Namibia, as well as the construction and extension of substations in these three countries.

In the year 2010, tenders were advertised for provision of consultancy services for financial, legal, technical and transaction advisory services for the development of the project. ZIZABONA members have embarked on a road map to package the project. The project was one of the key transmission projects that were presented at the Energy Infrastructure Development Conference 2010 held in Frankfurt, Germany in 2010.

The investment conference was a joint initiative of the SADC and the Southern Africa Initiative of German Business.

Zambia–Tanzania-Kenya Interconnector

There was no major development on this project in 2010 despite the project’s importance in linking Eastern and Southern Africa power systems.

SAPP System Disturbances

In the period under review, annual performance data shows that a number of system disturbances occurred on the SAPP interconnected system. Disturbances were recorded throughout the year except for July and December. The highest number of incidences occurred in January which had 66 disturbances while the least was recorded in February and April which recorded 1 incidence each. Major disturbances reported included power swings resulting from load rejection from faults from High Voltage Direct Current (HVDC) system, voltage flash-overs caused by heavy mist and loss of generation of 1,200 MW. Figure 5 highlights the system disturbances on a monthly basis.

FIGURE 5: SAPP SYSTEM DISTURBANCES

![SAPP Frequency of System Disturbances Chart]

SOURCE: SAPP
SAPP also states that other causes of these system disturbances were initiated by lightning and bad weather conditions.

**EREP Project**

The ERB received financial support from the Swedish International Development Cooperation Agency (Sida) to finance the Electricity Regulation Enhancement Project (EREP).

EREP sought to further strengthen ERB's regulatory capacity in the following work streams:

1. **Design a Regulatory Framework for Bulk Power Purchase and Supply.** This workstream involves the development of:
   a. A pricing framework for bulk power contracts between the utilities, large customers, independent power producers (IPPs) and their off-takers.
   b. A mechanism that improves objectivity and transparency in the power purchase agreement (PPA) review process.
   c. A model that assesses the impact of electricity tariff changes on the various sectors of the economy and propose appropriate tariff policies that are consistent with macro-economic objectives of the country.

2. **Implementation of the Zambian Grid Code.** The main activities include:
   a. Propose options for the implementation of the Grid Code.
   b. Review the proposed transmission tariff methodology.
   c. Review the draft system operator licence.

3. **Design a Regulatory Framework for Off-Grid Electricity Systems.** This workstream involves the designing of a light handed regulatory framework to encourage and facilitate the development of off-grid systems with focus on:
   a. Developing technical guidelines for off-grid schemes.
   b. Developing a tariff methodology for off-grid schemes.
   c. Developing appropriate licences for off-grid schemes.
   d. Developing a mechanism to oversee operations of these off-grid schemes once they have been licensed and commissioned.

In May 2010, CORE International was engaged as a consultant by the ERB to undertake the project. They commenced work in July 2010 and the project is expected to be completed by June 2011.

**8.0 CHALLENGES FACING THE ELECTRICITY SUPPLY INDUSTRY**

Access to quality, reliable and affordable electricity services continues to be a major binding constraint to Zambia's transformation into a prosperous middle income country. This challenge can only be unlocked if the opportunities presented by the Zambian electricity supply can be exploited as a matter of urgency. In this regard, the ESI sub-sector still faces the following challenges:

- The lumpiness and the long gestation period of electricity infrastructure investments that are further accentuated by slow decision making processes that consequently exacerbate the inadequate generation and transmission capacities both locally and regionally to meet the ever increasing demand;
- The slow institutionalisation of KPIs by the incumbent utility;
- The perception that attainment of cost reflective tariffs on its own is adequate to address the challenges of the Zambian ESI. The observed slow adoption of commercial ethos and related organisational re-engineering partly arises from such perception;
- Single sourcing of developers for major electricity infrastructure that has potential to limit benefits;
- Inability to properly package and design bankable projects that attract project finance; and
- Low access rates on account of high cost of connections and limited coverage of the electricity grid.
9.0 PROSPECTS FOR 2011 IN THE ELECTRICITY SECTOR

The prospects for 2011 include the following:

- The much needed energy mix in the ESI will begin to materialize with the progress on the HFO and coal fired electricity generation plants;
- Government boldness and assertiveness in actualizing long outstanding projects;
- Increase in demand due to large mining projects and increased economic activities; and
- Financial engineering in project finance like involvement of public-private partnerships and securing major financial support from institutions like DBSA, China Import and Export Bank.
PART II – PETROLEUM SUB-SECTOR

10.0 NATIONAL CONSUMPTION OF PETROLEUM PRODUCTS IN 2010

The total national consumption of petroleum products has continued to increase on account of increased economic activities. In 2010, consumption increased by 6.7% to 753,652 MT from 706,232 MT in 2009. Figure 6 shows the national consumption of petroleum products from 2007 to 2010.

In 2010, annual consumption of LSD, Diesel, ULP and Kerosene increased by 24.6%, 8.2%, 5.6% and 11.3% from 2009, respectively. However, consumption of HFO, LP Gas, Avgas and Jet-A1 declined by 22.0%, 11.9%, 12.4% and 1.8% in 2010 from 2009, respectively.

FIGURE 6: NATIONAL CONSUMPTION OF PETROLEUM PRODUCTS

10.1 PROVINCIAL CONSUMPTION OF PETROLEUM PRODUCTS

Lusaka Province recorded the highest proportion of Diesel consumption while the lowest, at 1.0%, was recorded by Luapula Province. Figure 7 shows the distribution of national Diesel consumption in the nine (9) provinces of Zambia. The figure shows that 39.4% of Diesel consumed nationally in 2010 was attributed to Lusaka Province, 24.8% to Copperbelt Province, 13.8% to North Western Province and 22.0% to other provinces.

Largest provincial share of national ULP consumption, at 53.8% in 2010 was attributed to Lusaka Province and 23.4% to Copperbelt Province, as shown in Figure 7. Therefore, Lusaka and Copperbelt Provinces together accounted for 77.2% of national ULP consumption while 22.8% is attributed to the other provinces. Luapula and Western Provinces accounted for the lowest proportions of national ULP consumption in 2010.

In 2010, the Copperbelt Province recorded the highest proportion of national Kerosene consumption at 49.5% followed by Lusaka Province at 24.4%. Figure 7 presents provincial Kerosene consumption profile for 2010. Luapula, North-Western and Western Provinces were among the provinces that recorded the lowest proportion of national Kerosene consumption in 2010 at 0.7%, 0.5% and 1.1% respectively.
National consumption of LSD in 2010 was almost wholly attributed to the Copperbelt and North-Western Provinces, as Figure 7 shows. The two provinces together accounted for 98.99% of national LSD consumption for 2010. Lusaka Province accounted for 0.95% with the lowest proportion recorded for Central, Eastern and Luapula Provinces at 0.02% of 2010 LSD consumption. There were no records of LSD consumption for Northern, Southern and Western Provinces in 2010.

**FIGURE 7: 2010 PROVINCIAL CONSUMPTION PROFILE**

11.0 DEVELOPMENTS IN THE PETROLEUM SUB-SECTOR

11.1 OPERATIONS AT INDENI

During the period under review, INDENI processed 625,139.87MT of feedstock which represents a 6.6% increase compared to 2009. The composition of the feedstock was 50.5% diesel, 31.9% Murban crude oil and 17.6% of Heavy Naphtha. The high proportion of diesel in the feedstock is on account of a steep increase in the demand for white products (diesel and unleaded petrol) and a decline in the demand for black products (HFO and LFO). The configuration of the feedstock at inception of Indeni was about 80% crude and the remainder was either diesel or naphtha. At the time, demand for HFO was high in the mining sector. Overtime, the mining industry has either been in decline or switched to alternative energy sources.

Figure 8 shows the upward trend in the quantity of feedstock processed by the Refinery from 2005 to 2010.
In 2010, INDENI was in full operation for 296 days and on shutdown for 69 days. This is an improvement from 2009 when the refinery was on-stream for 282 days and on shutdown for 83 days. The longest shutdown was for 48 days from September 2010 when the refinery went on planned annual general maintenance and catalyst regeneration. The other 21 days of shutdowns were attributable to equipment failure and intermittent ullage constraints in storage tanks at both the Ndola Fuel Terminal (NFT) and INDENI. This is in contrast to previous years when one of the reasons for the shutdown was intermittent supply of petroleum feedstock. In 2010, this did not arise because Government had entered into a fixed contract for the supply of petroleum feedstock with Glencore (UK) Ltd.

11.2 OPERATIONS AT TAZAMA PIPELINES LTD

In 2010, the pumping rate for the pipeline continued to be limited to 100-105 m$^3$/hour on account of the poor state of certain sections of the pipeline. In order to improve the pumping rate, TAZAMA engaged a contractor during the year to repair a stretch of 22km of the pipeline between Ilula and Iringa pumping station. The works are expected to be completed in 2011 at an approximate cost of US$3.6 million. Upon completion of these works, pumping rates are expected to improve to about 110-115 m$^3$/hour.

In 2010, a total throughput of 583,385MT$^7$, the highest recorded since 2006, was pumped representing a 5.34% increase compared to 553,824MT in 2009. Figure 9 shows that on a year-to-year basis, the throughput levels have been rising and that was largely as a result of the improved operations of the refinery and the improved supply of petroleum feedstock.

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$^7$ Note that the annual throughput for TAZAMA does not equal to INDENI feedstock processed due to brought forward feedstock balances from previous year and product losses at the refinery.
11.3 REHABILITATION OF PROVINCIAL DEPOT STORAGE SITES

In 2010, the Government embarked on a program to refurbish the old provincial depots around the country and to construct new depots in order to provide storage for petroleum products in the provinces. The storage facilities will also be used to store the nation’s strategic petroleum reserves. The depots that are targeted for rehabilitation are in Eastern, Luapula, Lusaka, Northern, North-Western, Southern, and Western provinces. The provincial storage depots are expected to improve the efficiency in the supply of petroleum products in areas farther away from INDENI Petroleum Refinery. The provincial fuel storage sites are also expected to increase the availability of fuel in the various provinces and cut down on the time and resources spent in transporting the fuel from source.

The depot sites that are being rehabilitated are shown in Table 6 and all the sites will store both petrol and diesel.

**TABLE 6: PROVINCIAL DEPOT SITES**

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>LOCATION</th>
<th>CAPACITY M^3</th>
<th>NUMBER OF TANKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lusaka</td>
<td>Lusaka</td>
<td>24,000</td>
<td>4</td>
</tr>
<tr>
<td>Northern</td>
<td>Mpika</td>
<td>6,000</td>
<td>4</td>
</tr>
<tr>
<td>North-western</td>
<td>Solwezi</td>
<td>15,000</td>
<td>4</td>
</tr>
<tr>
<td>Western</td>
<td>Mongu</td>
<td>6,000</td>
<td>4</td>
</tr>
</tbody>
</table>

*SOURCE: MEWD*
Dalbit International Ltd was contracted by Government in November 2010 to undertake the refurbishment and construction works of the provincial depots at a total cost of US$29.5 million. The duration of the contract is 18 months but works on the sites listed in Table 6 are expected to be completed by December 2011. Further, additional sites in the other provinces will be considered for rehabilitation in 2012.

11.4 DEVELOPMENTS IN PETROLEUM DISTRIBUTION

The petroleum sub-sector in 2010 had 30 licenced Oil Marketing Companies (OMCs), of which four (Dalbit Petroleum, Ngucha Enterprises, Oasis Oil and Puma Energy) were licensed during the year. However, some of the OMCs such as Spring Energy, Anegi Oil and Gulf Oil were inactive.

During the year under review, there were two takeovers of existing OMCs. Engen International Holdings Limited (the holding company of Engen Petroleum Zambia Limited) concluded the 100% purchase of Chevron Zambia Limited. The Zambian acquisition was part of the deal which involved the acquisition of 100% Chevron downstream marketing companies in Zambia, Malawi, Tanzania, Mauritius, Reunion, Zimbabwe as well as the assets of Chevron in Mozambique. Chevron Zambia Limited consequently changed its name to Engen Marketing Limited, as the first step in rebranding all the former Chevron retail sites to the Engen brand to reflect the new shareholding.

Further, BP Africa sold its 75% shareholding in BP Zambia Plc to Puma Energy (Ireland) Holdings Limited, a wholly-owned subsidiary of Puma Energy International B.V. The balance of 25% is owned by the public through the Lusaka Stock Exchange (LUSE). Puma Energy International B.V. was formed in 1997, and has grown rapidly to become one of the largest independent downstream companies. The company operates in over 25 countries worldwide, and is headquartered in Switzerland. Puma Energy International B.V. is a subsidiary of Trafigura Beheer B.V.

The deal followed BP Africa’s decision to withdraw from the retailing of petroleum products in Southern Africa to focus on refining and marketing investments in countries offering more synergies with supply portfolios. The decision affected BP retail operations in Namibia, Botswana, Zambia, Malawi and Tanzania, however the sale in each country is subject to national regulatory approvals. The regulatory approvals for the BP Zambia purchase had not yet been granted as at the end of 2010.

12.0 OMC MARKET SHARES OF WHITE PRODUCTS

BP Zambia continued to dominate the market for white products in 2009 and 2010. Total Zambia was second to BP Zambia and together they accounted for 57.1% market share in 2010 and 56.8% in 2009. Market shares of white products for eleven (11) small to medium sized OMCs increased in 2010 while those for other OMCs decreased (See Figure 10).
Despite a marked decrease in market share (MS) for 2010, BP Zambia had the largest MS of lubricants at 32.4%, ahead of Spectra Oil and Total Zambia at 20.0% and 13.6% respectively. The MS for Dana Oil increased marginally to 14.8% from 12.2% in 2009. However, MSs of lubricants for Total Zambia, Chevron Zambia and Kobil Zambia fell marginally in 2010. Fuchs Zambia accounted for 3.9% of national lubricant consumption. In general, most OMCs recorded declines in MSs of lubricants in 2010.
14.0 FUEL SUPPLY DURING THE INDENI PLANNED SHUTDOWN IN 2010

The fuel supply was not affected by the scheduled refinery shut down due to measures that the Government had put in place to forestall a fuel crisis. The Government through Ministry of Energy and Water Development (MEWD) engaged Dalbit Petroleum to supply 40 million litres of diesel and 50 million litres of petrol between August and December 2010.

The Government in conjunction with the ERB also facilitated the importation of specific volumes of petrol and Jet A1 by BP Zambia and Total Zambia, through a price support mechanism (i.e. the Government paid the difference between the landed price of imports that was higher than the regulated fuel prices). Total Zambia imported 3 million litres of Jet A1, and 2.4 million litres of petrol, whilst BP Zambia imported 2.8 million litres of Jet A1 and 2.5 million litres of petrol.

Increased availability of storage capacity greatly contributed to the successful stock piling of the imported fuel. The added storage capacity included the 40 million litres diesel tank at TAZAMA that was commissioned in 2009 plus two tanks at the NFT that were rehabilitated with capacities of 14 million litres for petrol and 9.6 million litres for diesel. Government also leased two diesel tanks, with a combined capacity of 3.6 million litres, at Luano depot from CEC.

15.0 PROMOTION OF DOMESTIC USAGE OF LP GAS

According to Central Statistical Office (CSO) over 80% of households use biomass (charcoal and firewood) for cooking and heating, which have negative impacts on the environment, human health and gender profile. This is not sustainable and as such, the Government embarked upon the promotion of household use of LP Gas. LP Gas has not been widely used in Zambia, with only 0.1% of households consuming
the gas as an energy source in 2000\(^9\). This is due to a number of factors including adequate hydro
generated power which has been available at low tariffs. However, the recent power deficits and
concerns over the high levels of deforestation have led to the Government and other stakeholders to
commence activities aimed at promoting the use of LP Gas as an alternative domestic source of energy.

In 2009, the ERB embarked upon a programme to promote the household use of LP Gas to enable as
many people as possible have access to energy and to encourage energy and environmental conservation.
This is in line with the 2008 National Energy Policy which seeks to promote the use of alternative energy
sources such as LP Gas. The ERB, therefore, constituted an LP Gas Task Team to spearhead the
development of a regulatory framework and strategies to promote domestic usage of LP Gas. The Task team developed technical guidelines and checklists from the existing LP Gas technical
standards and a code of practice on basic design criteria, use and maintenance of portable metal
containers for compressed, dissolved and liquefied gases and is scheduled for publication in 2011. This
standard will enhance safety with regard to the usage of LP Gas cylinders and containers.

The LP Gas regulatory framework and promotional strategies are expected to be launched and
implemented in 2011. Figure 12 indicates the level of LP Gas produced by INDENI that is exported
compared to what is consumed locally. On average, about 80% of locally produced LP Gas is exported.

**FIGURE 12: LP GAS CONSUMPTION**

<table>
<thead>
<tr>
<th>Year</th>
<th>Export</th>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>5,542</td>
<td>1,449</td>
</tr>
<tr>
<td>2009</td>
<td>7,829</td>
<td>1,812</td>
</tr>
<tr>
<td>2010</td>
<td>5,385</td>
<td>1,381</td>
</tr>
</tbody>
</table>

**16.0 PETROLEUM PRICING IN 2010**

**16.1 MOVEMENTS IN INTERNATIONAL AND DOMESTIC PRICES IN 2010**

The ERB continued to apply the Cost-Plus Pricing Methodology (CPM) in the determination of the
wholesale prices of petroleum products in the year 2010. The main determinants of the domestic
wholesale fuel prices are the oil prices on the international markets and the exchange rate of the
Zambian Kwacha to the United States Dollar.

International Oil Prices

Crude oil prices in 2010 exhibited an upward trend and mostly lingered between US$70-90/bbl. The spot price for the US crude oil benchmark, West Texas Intermediate (WTI) increased from US$78.34/bbl in January 2010 to US$88.66/bbl in December 2010. Brent, on the other hand, increased by 20.4% from 76.61/bbl in January 2010 to US$92.21/bbl in December 2010.\(^\text{10}\)

Figure 13 shows the trend in international crude oil prices (based on WTI).

**FIGURE 13: WTI CRUDE OIL PRICES IN 2009 AND 2010**

Crude oil prices soared from a low of $39/bbl in February 2009 to reach $88.66/bbl in December 2010.

The movements in the crude oil prices were on account of various factors that include:
- Increase in demand led by emerging markets, e.g. China and Brazil, and to a lesser extent in developed countries such as the US and Japan;
- OPEC, which is responsible for about 40% of the world crude oil supply, maintained its official production levels which were set back in 2008 throughout the year;
- The switch from investing in stocks to commodities by fund managers;
- US crude oil and petroleum products inventory levels; and
- Geo-political tensions in oil producing countries such as Iraq and Nigeria.

Murban is the crude oil that is in the commingled petroleum feedstock imported in Zambia and the evolution of its prices in 2010 is shown in Figure 14. The other products in the feedstock are Gas oil and Naphtha.

\(^{10}\) In international oil trading WTI and Brent are the two main oil benchmarks used for pricing.
Exchange rates

The Kwacha/US dollar exchange rate was fairly stable during 2010 but depreciated by 4.65% from January to December. In 2009, the kwacha appreciated by 5% against the US dollar exchange rate – see Figure 15.

FIGURE 15: INTERBANK EXCHANGE RATES

SOURCE: BANK OF ZAMBIA
In the first half of the year, the Kwacha/US dollar exchange rate depreciated by about 13.2% from January to June 2010. However, in the second half of the year, this trend was reversed and the rate appreciated by 5.68%. The kwacha’s loss in value in the first half was due to weaker Copper prices and the debt crisis in the Euro zone which continued to dampen the prospects for the appreciation of the Kwacha. In May 2010, Copper prices fell as low as US$6,502/tonne – the lowest since February 2010 from a high of about US$7,900/tonne in April 2010.

However, in the last half of the year, the kwacha generally remained strong and was supported by the following factors:
- the rising copper prices which reached a record high of US$9,616/tonne by 31st December 2010;
- increased supply of foreign exchange in the domestic market arising from strong export earnings in the mining and non-traditional sectors; and
- positive sentiment in the market due to the generally good performance of the economy as indicated by the strong macro-economic fundamentals.

**Domestic Fuel Prices**

Wholesale prices of fuel were adjusted only twice during the year, in January and May 2010, despite the country receiving seven petroleum feedstock cargoes with different landed costs. The difference in prices was absorbed by the Government in order to maintain stability in the economy.

The price review effected in January 2010 resulted in wholesale price increases in the range of 15-19% and pump prices of petrol, diesel and kerosene increased by an average of 15%. This adjustment was the first in 13 months with the previous one having been effected on 22nd December 2008. The price review in May 2010 resulted in pump prices increasing by an average of 11.2%.

Table 7 shows the list of petroleum feedstock cargoes received in 2010 and the cost of each cargo. Ordinarily, price changes should have been effected on receipt of each cargo as per the principles of the CPM.

**TABLE 7: PETROLEUM FEEDSTOCK CARGOES IMPORTED IN 2010**

<table>
<thead>
<tr>
<th>CARGO</th>
<th>MONTH DOCKED IN DAR-ES-SALAAM</th>
<th>TONNAGE</th>
<th>COST OF CARGO US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mt Ce Ulsan</td>
<td>January 2010</td>
<td>70,529</td>
<td>52,963,046</td>
</tr>
<tr>
<td>2. Mt Sea Voyager</td>
<td>March 2010</td>
<td>94,357</td>
<td>68,578,153</td>
</tr>
<tr>
<td>3. Mt Petrovsk</td>
<td>April 2010</td>
<td>90,086</td>
<td>69,973,268</td>
</tr>
<tr>
<td>4. Mt Zaliv Anadyr 1</td>
<td>June 2010</td>
<td>89,503</td>
<td>65,264,088</td>
</tr>
<tr>
<td>5. Mt Zaliv Anadyr 2</td>
<td>July 2010</td>
<td>96,002</td>
<td>69,306,067</td>
</tr>
<tr>
<td>6. Mt Sea Voyager</td>
<td>August 2010</td>
<td>93,870</td>
<td>67,506,728</td>
</tr>
<tr>
<td>7. Mt Th Sound</td>
<td>December 2010</td>
<td>89,730</td>
<td>81,107,718</td>
</tr>
</tbody>
</table>

SOURCE: MEWD

Figure 16 shows the movement in the wholesale prices of petrol, diesel and kerosene and cost of the cargo in 2009 and 2010.
The ERB effected Uniform Petroleum Pricing (UPP) mechanism in September 2010, for petrol, diesel and kerosene. This is in line with Government pronouncement to charge uniform prices for petroleum products countrywide, thereby mitigating the high cost of fuel in outlying areas. The implementation followed Government’s announcement in 2009 that the country would have UPP by June 2010.

Prior to the introduction of UPP, the cost of petrol, diesel and kerosene at retail sites farthest from the NFT was higher than the price obtaining at sites closer to the NFT. The UPP Mechanism is designed to be self financing through a Rural Fuel Subsidy Fund (RFSF). The UPP mechanism works in such a manner that OMCs with service stations that are located closer to Ndola contribute to the RFSF whilst OMCs with service stations farther away from the Ndola claim from the RFSF. Independent dealers remit to or claim directly from the RFSF.

Other key features of the UPP Mechanism are:

i. The uniform petroleum price is a cap and not a fixed price; and
ii. Commercial sales are not part of the current UPP mechanism.

The new national uniform pump prices announced in September 2010 were as follows:

- Petrol K7,639/litre;
- Diesel K6,999/litre; and
- Kerosene K5,008/litre.

The retail fuel prices in the provincial headquarters changed as reflected in Table 8.
The receipts into and payments from the RFSF are managed by the ERB. Ashfield Resources (Z) Limited was contracted by MEWD as the UPP Manager with the primary responsibility of assessing and verifying the contributions into and claims from the RFSF.

The UPP Mechanism has performed satisfactorily. Since its implementation it has been well received by the general public and other stakeholders. Consumers in outlying areas have commended the implementation of the UPP Mechanism because it has leveled the fuel prices across the country. Before its implementation, these consumers felt discriminated against because of their geographical location and this adversely affected their economic activities in comparison to those who are nearer to Ndola. It is expected that the UPP mechanism will translate into increased economic activity in these areas.

### 16.3 REVIEW OF DOWNSTREAM PETROLEUM MARGINS

The margins for OMCs, dealers and transporters are incorporated in the price of fuel. The ERB revised downstream petroleum margins in May 2010, as follows:

i. OMC margin – An increase of 15% from K345/L to K397/L.
ii. Dealer margin – An increase of 15% from K229/L to K263/L.
iii. The transportation rates increased by an average of 24%. The transportation rates from Ndola to the respective provincial headquarters were revised as indicated in Table 9.

The margins were last reviewed in March 2007.

### TABLE 9: TRANSPORTERS MARGINS IN KWACHA/LITRE (K/L)

<table>
<thead>
<tr>
<th>TOWN</th>
<th>OLD TRANSPORT CHARGES</th>
<th>REVISED TRANSPORT CHARGES</th>
<th>% CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K/L</td>
<td>K/L</td>
<td></td>
</tr>
<tr>
<td>Chipata</td>
<td>408</td>
<td>514</td>
<td>26%</td>
</tr>
<tr>
<td>Kabwe</td>
<td>95</td>
<td>116</td>
<td>22%</td>
</tr>
<tr>
<td>Kasama</td>
<td>332</td>
<td>413</td>
<td>24%</td>
</tr>
<tr>
<td>Livingstone</td>
<td>368</td>
<td>453</td>
<td>23%</td>
</tr>
<tr>
<td>Lusaka</td>
<td>148</td>
<td>184</td>
<td>24%</td>
</tr>
<tr>
<td>Mansa</td>
<td>298</td>
<td>370</td>
<td>24%</td>
</tr>
<tr>
<td>Mongu</td>
<td>391</td>
<td>486</td>
<td>24%</td>
</tr>
<tr>
<td>Ndola</td>
<td>39</td>
<td>50</td>
<td>28%</td>
</tr>
<tr>
<td>Solwezi</td>
<td>140</td>
<td>170</td>
<td>21%</td>
</tr>
</tbody>
</table>

SOURCE: ERB
16.4 STRATEGIC RESERVES FUND

During 2010, the ERB continued to manage the Strategic Reserves Fund (SRF). The SRF rates were revised in May 2010 to the following levels as outlined in Table 10.

**TABLE 10: SRF COST LINE PER PRODUCT**

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>UNITS</th>
<th>SRF COST - LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>K/Litre</td>
<td>476.11</td>
</tr>
<tr>
<td>Diesel</td>
<td>K/Litre</td>
<td>141.14</td>
</tr>
<tr>
<td>Kerosene</td>
<td>K/Litre</td>
<td>229.00</td>
</tr>
<tr>
<td>Jet A1</td>
<td>K/Litre</td>
<td>229.00</td>
</tr>
<tr>
<td>HFO</td>
<td>K/KG</td>
<td>286.26</td>
</tr>
<tr>
<td>LP Gas</td>
<td>K/KG</td>
<td>286.26</td>
</tr>
</tbody>
</table>

*SOURCE: ERB*

In 2010, the SRF made payments amounting to K120.8 billion for various activities which included:

i. rehabilitation of the NFT;
ii. construction and refurbishment of the provincial storage tanks;
iii. procurement of petroleum feedstock; and
iv. price support to OMCs that imported jet A1, LP Gas and unleaded petrol during the period that INDENI was on shutdown.

It is expected that payments for rehabilitation works at both the NFT and provincial depots will continue to be made in 2011 as the works are still ongoing.
17.0 OTHER FORMS OF ENERGY

17.1 RENEWABLE ENERGY

In 2010, MEWD in line with the 2008 National Energy Policy published the Renewable Energy Strategy that defines renewable energies in the Zambian context to include solar, geo-thermal, mini-hydro, energy crops and wind. It also sets out Government’s targets for introducing renewable energy in the national energy mix.

17.2 BIO-FUELS

There were no major developments in the bio-fuels sector in 2010.

18.0 CHALLENGES FACING THE PETROLEUM SECTOR

The challenges in the petroleum sub-sector have largely remained the same as in previous years. They include:

- Poor state of repair of the major infrastructure in the petroleum supply chain, namely the Refinery, the Pipeline, and the NFT;
- The imbalance in the distribution of service stations. While a few service stations are found in the rural areas OMCs continue to build more service stations in urban areas especially Lusaka and the Copperbelt Provinces;
- Failure by the retail service sites to adhere to the technical requirements set out in ZS385 part 2 and 311.
- Illegal fuel vending has continued to be a major problem especially in the areas that have no service stations; and
- The failure to maintain 15 days stocks by the OMCs.

19.0 PROSPECTS FOR 2011 IN THE PETROLEUM SECTOR

The rehabilitation of the NFT and provincial depots that the Government embarked upon in 2010 are expected to be completed by 2012. Once the works have been completed, the integrity of the NFT will be restored and the country’s storage capacity will increase.

Further, the plans to set up a 50MW HFO thermal power plant adjacent to INDENI Petroleum refinery will, apart from providing a market for HFO, improve the uptake of the fuel and free up storage capacity for the product. This will reduce the problems related to ullage constraints experienced by the refinery. HFO will be the primary energy source to run the power station.

The planned revival of the Bitumen plant in Ndola will be a positive development for the country especially given the many road works projects being undertaken by the Government.

Indeni is planning to acquire an isomerizer to improve its output of LSD and a hydro-treater to extend the life span of the catalyst. With a hydro-treater in place, the annual maintenance shutdown will happen every two years.

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11 ZS 385 Part 2: Electrical installations in the distribution and marketing sector and ZS 385 Part 3: The installation of underground storage tanks, pumps/dispensers and pipe work at filling stations and consumer installations.
## PROPOSED AND ADJUSTED TARIFF SCHEDULE FOR 2010

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OLD TARIFFS TARIFFS (ZMK) 2010</th>
<th>ZESCO PROPOSED TARIFFS (ZMK) 2010</th>
<th>ERB APPROVED (ZMK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. METERED RESIDENTIAL (capacity 15kVA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1 - Consumption up-to 100kWh</td>
<td>Energy charge/kWh</td>
<td>108</td>
<td>181</td>
</tr>
<tr>
<td>R2 - Consumption between 101 &amp; 400 kWh</td>
<td>Energy charge/kWh</td>
<td>178</td>
<td>299</td>
</tr>
<tr>
<td>R3 - Consumption above 400 kWh</td>
<td>Energy charge/kWh</td>
<td>290</td>
<td>487</td>
</tr>
<tr>
<td>Pre-paid Tariff</td>
<td>Energy charge/kWh</td>
<td>197</td>
<td>323</td>
</tr>
<tr>
<td>Fixed Monthly Charge (applicable to all residential customers)</td>
<td></td>
<td>10,375</td>
<td>17,430</td>
</tr>
<tr>
<td>2. COMMERCIAL TARIFFS (capacity 15kVA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Energy charge/kWh</td>
<td>210</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>37,601</td>
<td>51,889</td>
</tr>
<tr>
<td>3. SOCIAL SERVICES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools, hospitals, orphanages, churches, water pumping &amp; street lighting</td>
<td>Energy charge K/kWh</td>
<td>180</td>
<td>266</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>31,215</td>
<td>46,198</td>
</tr>
<tr>
<td>4. MAXIMUM DEMAND TARIFFS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD1 - Capacity between 16 - 300 kVA</td>
<td>MD charge/kVA/Month</td>
<td>10,166</td>
<td>11,691</td>
</tr>
<tr>
<td></td>
<td>Energy charge /kWh</td>
<td>146</td>
<td>168</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>99,563</td>
<td>114,497</td>
</tr>
<tr>
<td>MD2 - Capacity 301 to 2,000 kva</td>
<td>MD charge/kVA/Month</td>
<td>19,018</td>
<td>25,808</td>
</tr>
<tr>
<td></td>
<td>Energy charge /kWh</td>
<td>125</td>
<td>169</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>199,124</td>
<td>270,211</td>
</tr>
<tr>
<td>MD3 Capacity 2,001 to 7,500kVA</td>
<td>MD charge/kVA/Month</td>
<td>35,659</td>
<td>43,504</td>
</tr>
<tr>
<td></td>
<td>Energy charge /kWh</td>
<td>114</td>
<td>139.00</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>492,467</td>
<td>600,810</td>
</tr>
<tr>
<td>MD4 - Capacity above 7500kVA</td>
<td>MD charge/kVA/Month</td>
<td>35,462</td>
<td>43,264</td>
</tr>
<tr>
<td></td>
<td>Energy charge /kWh</td>
<td>94</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>Fixed Monthly Charge</td>
<td>984,933</td>
<td>1,201,618</td>
</tr>
</tbody>
</table>
## Proposed and Adjusted Tariff Schedule for 2010

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>OLD TARIFFS (ZMK) 2010</th>
<th>ZESCO PROPOSED TARIFFS (ZMK) 2010</th>
<th>ERB APPROVED (ZMK)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MD TIME OF USE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD charge/kVA/Month</td>
<td>MD category, 25% discount on Capacity charge</td>
<td>MD category, 25% discount on Capacity charge</td>
<td>MD category, 25% discount on Capacity charge</td>
</tr>
<tr>
<td>Energy charge /kWh</td>
<td>MD category, 50% discount on energy charge</td>
<td>MD category, 50% discount on energy charge</td>
<td>MD category, 50% discount on energy charge</td>
</tr>
<tr>
<td>Fixed Monthly Charge</td>
<td>Applicable fixed charge</td>
<td>Applicable fixed charge</td>
<td>Applicable fixed charge</td>
</tr>
</tbody>
</table>

SOURCE: ERB
APPENDIX 2

KEY PERFORMANCE INDICATORS (2008 to 2011)

A. METERING CUSTOMERS
   i. All new customers are metered upon connection.
   ii. All new residential connections should be done within 30 days after a customer pays for connection.
   iii. All un-metered customers are metered by March 2011. The milestone for this KPI is that one-third (1/3) of the backlog is metered every year till March 2011.

B. CASH MANAGEMENT
   i. All customers are billed timely and on a regular basis.
   ii. Reduce debtor days to not more than 60 days by March 2011. The milestone for this KPI is that one-third (1/3) of the target is reduced every year till March 2011.
   iii. Total trade receivables do not exceed 17% of turnover by March 2011.
   iv. Total receivables do not exceed 17% of total income by March 2011.

C. STAFF PRODUCTIVITY
   i. Increase number of customers per employee to 100 customers per employee by March 2011.
   ii. Reduce staff costs from current levels of about 49% of operating budget to about 30% of operating budget by March 2011.

D. QUALITY OF SERVICE SUPPLY
   i. Reduce annual unplanned outages to 5 hours per customer by March 2011.

E. SYSTEM LOSSES
   i. Maintain transmission losses at 3% or less.
   ii. Reduce distribution losses to 14% by March 2011.