



The Energy Regulator

Newsletter

AN ENERGY REGULATION BOARD NEWSLETTER

THIRD ISSUE 2009

AFTER



BEFORE



Rehabilitated Fuel Storage tank at Ndola Fuel Terminal

Editorial



Dear Readers,
During the last quarter of 2009, the regulator was busy with a number of activities aimed at safeguarding your interests. In the wake of a tariff increment in electricity, the ERB embarked on a series of public meetings which were conducted in various parts of the country. The objective of the sensitization exercise was

to educate and inform the public about the reasons and rationale behind the increment, among other issues. To this end meetings were held in Southern Province, North Western and Copperbelt Provinces. Read more about these meetings and what people's views were with regard to the tariff increment.

In a related development, the ERB received and assessed ZESCO's performance status with regard to Key Performance Indicators. Under the Multi Year Tariff Framework (MYTF) awarded to ZESCO, the utility is required to address a number of issues of public concern and report to the regulator on a quarterly basis. This has a direct bearing on the tariff awarded to ZESCO. This issue highlights ZESCO's performance with regard to areas of concern like metering, billing, cash management etc.

Residential Consumers, among other stakeholders criticize ZESCO on the quality of service offered by the utility. One way the ERB is working to ensure that concerns and complaints from members of the public are addressed is by formation of Consumer Watch Groups (CWGs) in various parts of the country. The ERB has now established CWG in provincial centres, Kitwe and Chingola. In total 11 energy CWGs have been established in the country. Find out more about your local CWG in this issue.

Readers might want to take note of the article on statistics which highlights the importance of statistics in decision making. Statistics are a necessity in almost every aspect of life and energy is no exception. As the year 2009 comes to an end and 2010 unfolds, it is worthwhile to keep in mind energy statistics for the past year to enable us make informed decisions for the New Year.

Enjoy the issue and a Happy New Year!

Kwali Mfuni
Editor

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ZESCO Key Performance Indicators: 1st, 2nd and 3rd quarters



Mr Sikota Wina stressing a point during a tour of ZESCO infrastructure

The Energy Regulation Board (ERB) continued to evaluate ZESCO's performance in relation to Key Performance Indicators (KPIs) on a quarterly basis. This is in order to monitor ZESCO's performance in improving efficiency and quality of service as agreed under the Multi Year Tariff Framework (MYTF). As such, for the period January to September 2009 ZESCO performance improved from 37% in the first quarter to 86.59% in the second quarter and 75 % in the third quarter.

The principle of the MYTF is for ZESCO to implement self-enforcing incentives in the form of KPIs embedded in the tariff framework. The KPIs, which were agreed with ZESCO in March 2007, are intended to, among other issues, address areas of concern such as quality of service and institutional efficiency. Areas of focus under KPIs are metering, cash management, staff productivity, quality of service and reduction of system losses.

It should be noted that in the 2009

Tariff Decision the ERB decided to provide a KPIs consolidation period of up to March 2011. During this period the KPI scores will have no direct bearing on subsequent tariff awards under the MYTF. This is in order to allow the utility reach cost reflective tariff levels as restricting revenue requirements would be detrimental to operations. However from April 2011, tariffs will be determined using the KPIs scores under the MYTF. In the interim, the KPIs still play the important function of monitoring ZESCO performance in delivery of services and the ERB will continue to inform the public accordingly. ZESCO's performance on each KPI for the period January – September 2009 is outlined below:

1. Metering:

Under the customer metering KPI, ZESCO performance has improved: The total backlog of unmetered customers has progressively reduced, from 29% in the first quarter to 21% in the second and 17% in the third quarter. This has been attributed to

scaling up of the meter installation exercise. Approximately 31,715 prepaid meters have been installed in Lusaka and Northern Division including 17,277 credit meters in Copperbelt, Lusaka, Northern and Southern Divisions. Consequently, the backlog of unmetered customers has declined to 62,244 against a target of 52,799 at the end of the third quarter 2009.

ZESCO is also required to meter all new customers within 30 days of connection. Between January and September 2009, ZESCO connected 25,004 customers, out of whom only 5,382 or 22% were metered. The remaining 19,622 newly connected customers are still unmetered thereby increasing the backlog of unmetered customers.

Metering of customers is important as the utility loses money in instances where customers use more power than they are required to pay for, while on the other hand, unmetered consumers may also be paying for more than they have actually consumed. In addition, unmetered customers might not be motivated to conserve power.

2. Connection Time

There was an improvement with regard to the time that the utility takes to connect new customers. ZESCO recorded a reduction of 62 days and 56 days for the second and third quarters respectively, from a high of 85 days in March 2009. However, this was still below the target of 56 and 51 days for the second and third quarters, respectively. On the other hand, the average number of days it takes to issue a quotation for potential customers increased to 48 days in the third quarter from 45 days in the second and 39 in the first quarter. This was against a target of 34 in the first quarter and 33 days for the second and third quarters.

3. Cash Management:

One of the goals of this KPI is for ZESCO to reduce the amount of money owed by customers, known as total receivables, from 45.37% in December 2007 to less than 17% of total turnover by March 2010. Total receivables were expected to reduce by 4.6% between April and September 2009. Total receivables however, increased by 6.9% during the same period, ending the second and third quarters at 63% and 68% against a KPI target of 31.6% and 29.3%, respectively. The KPI further stipulates that ZESCO should reduce trade receivables to not more than 17% of turnover by 2010. The quarterly target for ZESCO is to reduce trade receivables by 2.05%. ZESCO was therefore required to reduce trade receivables from 32.1% to 30% in the second quarter and from 30% to 27.98% in the third quarter of 2009. However ZESCO failed to meet this target during the second quarter as receivables increased by 0.91%, while the third quarter target was met as ZESCO reduced its receivables by 4.67%. Trade receivables at the end of the review period, stood at 36% against a target of 27.98%. With regard to debtor days, defined as the time ZESCO takes to pay its debts, ZESCO failed to meet the set targets for January to September 2009. Debtor days increased from

145 in the first quarter to 149 in the second quarter before reducing to 132 in the third quarter. This was against the set targets of 115, 107 and 99 respectively. Despite an improvement in the third quarter where debtor days reduced by 17 days from 149 days to 132, ZESCO did not meet the overall target of 99 days for the review period. ZESCO will have to do more to improve its debt management by improving performance on this KPI in order to meet the target of 60 days by March 2011.

4. Staff Productivity:

This KPI measures the number of customers each ZESCO employee services. The targets for the first, second and third quarters were a Customer-Employee ratio of 78, 81 and 84, whereas actual performance stood at 82, 85 and 78 respectively. The utility reported that the reduction in the number of customers serviced by each employee for the third quarter was due to an increase in the number of staff by 437 between January and September 2009 who were attached to various projects on a temporal basis.

5. Quality of Service:

This KPI is meant to measure improvements in ZESCO's quality

of service. Unplanned outages per customer were expected not to exceed 33 hours, 29 hours and 25 hours for the first, second and third quarters of 2009, respectively. Actual performance stood at 38.2 hours, 25.6 hours and 13 hours, respectively for the said quarters. There was an overall reduction of 24.60 hours between January and September 2009 in unplanned outages against a target of 7.91 hours.

6. System losses:

During the period under review, transmission losses, which are energy losses during transmission of power on high voltage lines of between 330kv and 66kv, were above the 3% target averaging 3.88% and 4.6% for the second and third quarters, respectively. Under this KPI, transmission losses should be maintained at not more than 3%. Distribution losses, which relate to energy lost during distribution on 66kv lines and below, stood at 17% and 15% at the end of the second and third quarter. The utility is required to reduce losses by 0.14% every month in order to attain the target of 14% by 2011. ZESCO's performance with regard to KPIs for January to September 2009 is summarised in the table below:

Table 1: Quarterly and year-to-date scores

Table 1: Quarterly and year-to-date scores

	Assessed Scores								
	Assigned Weight	First Quarter Score	First Quarter weighted score	Second Quarter Score	Second Quarter weighted score	Third Quarter Score	Third Quarter weighted score	Year to date Score	Year-to-date weighted score
	A	B	A*B	C	A*C	D	A*D	E	A*E
Customer Metering	30%	0.31	9%	1.00	30%	1.00	30%	1.00	30%
Cash Management	10%	0.00	0%	0.00	0%	0.04	0%	0.00	0%
Staff Productivity	15%	0.55	8%	0.77	12%	0.00	0%	0.00	0%
Quality of Service	20%	1.00	20%	1.00	20%	1.00	20%	1.00	20%
System Losses	25%	0.00	0%	1.00	25%	1.00	25%	1.00	25%
TOTAL	100%	0.37	37.46%	0.75	86.59%	0.61	75.42%	0.60	75.00%

ERB Conducts Public Meetings

The Energy Regulation Board (ERB) held public meetings in Southern, North Western and Copperbelt provinces during the period September to December 2009. The Southern Province meetings were held in Choma, Monze and Mazabuka from the 3rd to 5th of September 2009 in collaboration with ZESCO Area offices. The North Western Province meetings were held from 22nd to 26th September 2009, while the Copperbelt meetings were conducted at the end of December 2009 in Chingola and Mufulira. Approximately 200 people in the three towns participated at the said meetings.

CHOMA MEETING:



Choma Mayor Mr. Hajongoola opening the public meeting

In Choma about 65 people turned up for the public meeting held at Crystal Lodge. Participants to the meeting included members of the local Residential Development Committees (RDCs), farmers, local entrepreneurs, school teachers, civic leaders, hospital representatives, community leaders etc. His Worship the Mayor of Choma Mr. Tenson Hajongoola graced the occasion.

Residents of Choma brought out a number of concerns related to electricity supply, specifically load shedding and quality of service. There were complaints about illegal connections and load shedding. Residents also sought clarification from ZESCO on export of power by the utility despite a shortage in the country. Choma residents also wanted to be kept informed of ZESCO performance with regard to Key Performance Indicators. ZESCO Choma Manager Mr. Mbuli clarified that the load shedding schedule was managed at the National Control Centre and was not under the jurisdiction of his office.

Residents also appealed to the regulator to look into possibilities of implementing a uniform price of petroleum products in the country as they observed that prices were

- higher in provincial districts like Choma compared to Lusaka or Copperbelt Provinces. ERB informed participants that this was a consequence of the cost of transporting petroleum products from the Fuel Terminal in Ndola to various parts of the country which increased with distance.

MONZE MEETING:



Monze meeting in session

The Monze meeting was attended by about 70 local people and was officially launched by the District Administrator Mr. Emmerson Machila. In attendance at the meeting were local business representatives, hospital staff, school representatives, Chikuni Mission representative, civic authorities, representatives of RDC etc. Among the issues discussed by the attendants was the quality of electricity supply in the Chikuni area.

Participants reported that the transformer serving Chikuni Mission had blown during the course of 2009, and approximately 5,000 people in the area which includes two secondary schools, a mission hospital and a radio station had been adversely affected. In the interim ZESCO had to tap power from other townships in the district resulting in low voltage. The ZESCO Area Manager, Mr. Kabinda stated that a new transformer was expected following a request to Head Office for a replacement.

Other issues of concern highlighted by the residents included delayed response from the National Call Centre. The local ZESCO team was however commended for responding promptly to reported complaints. In addition a team comprising the District Commissioner, Monze General Hospital and ZESCO was put together to resolve a billing complaint raised by the Hospital. Monze residents requested ZESCO to include their town on the pre-paid meter exercise which had to date been extended only to parts of Lusaka and the Copperbelt provinces.

MAZABUKA MEETING:



Mazabuka Mayor Shadreck Mwiinga opening the meeting

The meeting which was held at Nchete Guest House was officially opened by His Worship the Mayor of Mazabuka, Mr. Shadreck Mwiinga. Issues raised at this meeting were similar to those raised in Choma and Monze and included complaints of unfair load shedding and use of electricity for electrifying fences on commercial farms. Mazabuka residents wondered why ZESCO employees were exempt from paying electricity bills. ERB stated that this anomaly had been noted by the Board and that the utility has been directed to charge all ZESCO employees for electricity consumed at the ERB approved residential tariff. Mazabuka residents appealed to the regulator to consider establishing a CWG in the town in view of the expanding economic activities in the district.



Mazabuka resident making a submission

NORTH WESTERN PROVINCE MEETINGS:



Public Meeting in session

North Western province meetings were held in Mwinilunga, Kabompo and Zambezi 22nd, 24th and 26th September 2009, respectively.

Over 150 people attended the Mwinilunga meeting which was officially opened by the District Commissioner Mr. Webster Samaseka. He bemoaned the satlack of a filling station and the high prevalence of illegal fuel vending in Mwinilunga. In order to curb illegal fuel vending which he said was common in the area. He advised that establishing a filling station in the area would curb the problem of illegal fuel vending.

In relation to the electricity sub sector, he requested for the district to be connected to the national grid. Mwinilunga residents were mainly concerned about the quality of service by ZESCO Participants complained that Mwinilunga is on a diesel generator and is restricted to a 17 hour power supply cycle from 07:00hrs to 24:00hrs .

The Kabompo meeting was equally well attended with a turnout of 120 participants and was held at Kabompo High School on 24th September 2009. The meeting was officially opened by the District Commissioner Mrs. Rebecca Mukuka. In her remarks, Mrs Mukuka highlighted the need for establishing a filling station and connecting the district to the national grid. Kabompo is also currently on a diesel generator which operates from 07:00hrs to midnight.

Issues raised in Zambezi were similar to issues discussed in Mwinilunga and Kabompo. as the district also uses a diesel generator. In his opening remarks, the Zambezi District Commissioner Mr. Bisalom Luwaile reiterated the need for a filling station and connection of the town to the national grid. The Major issues of concern raised at the meeting included load shedding and failure by ZESCO to resolve complaints on time, among other issues.

State of Petroleum infrastructure

Inspections conducted by the Energy Regulation Board reveal that a lot of petroleum infrastructure in the country is in need of urgent attention. These facilities span across the supply chain from the Single Point Mooring (SPM) off the coast of Dar-es-Salaam, (where the crude is off loaded) up to the filling stations where the refined product is pumped into your vehicle. Based on results of nationwide inspections conducted in 2008, some of the infrastructure most in need of urgent attention are the Single Point Mooring Facility, the submersible pipeline from the SPM to the Tazama Tank farm, Indeni, Ndola fuel Terminal and infrastructure in the rail transport system.

Single point Mooring facility and the pipeline:

Tazama Pipeline is jointly owned by the Zambian and Tanzanian Government with a shareholding of 67% and 33% respectively. It was built in 1968 and is used to transport crude oil (commingled feedstock) from Dar-es-Salaam to Ndola for refining.

The SPM facility is a crude oil offloading point for ships with a capacity of more than 40,000MT located in the Indian Ocean and is owned by the Tanzanian Port Authority. The SPM is also in need of rehabilitation as both the undersea and land pipeline have outlived their lifespan. As a precautionary measure pumping pressure has been reduced. An assessment for the rehabilitation of the SPM and the undersea pipeline has been conducted with support of TAZAMA and a report submitted to the Governments of Tanzania and Zambia. The two Governments are currently in discussions over rehabilitation of the same. Rehabilitation works have commenced at the Tazama Tank Farm (a storage facility on the coast of Dar-es-Salaam). The Tank Farm is the



Single Point Mooring Facility on the coast of Dar-es-Salaam

first point of storage for the feedstock before it is pumped to Ndola and has six tanks (3 by 36,000M3 and 3 by 41,000M3) with a combined total capacity of 231,000M3.

The pipeline is 1,710Km long with 7 pump stations installed at various points on the pipeline to facilitate pumping of the feedstock to Indeni for refining. Five of the pump stations are on the Tanzanian side due to its hilly terrain, while two

are on the Zambian side. Operating machines at the pump stations were bought second hand and have been operational since 1968. An ERB inspection showed that the pipeline and pump stations are in a poor state on both sides.

The 'pigging system' is another important aspect of the pipeline. This is an inspection technique where a metal instrument known as a 'pig' is introduced into a pipeline



Sample of a pig which is inserted into a pipeline



Indeni Oil Refinery in Ndola

through a launcher. The pig is pushed through the pipeline by the pressure of the product in the pipeline and is used to check for defects, clean the pipeline, separate products, or assess the pipeline integrity. Some of the problems revealed through pigging exercises over the years included corrosion of the 12 inch loop between Kigamboni and Morogoro on the Tanzanian side. As a result throughput reduced from 1.1m to 850,000 MT and 720,000MT in 2008. The weakest sections between the two areas have since been replaced with new pipes.

Railway & Road Transportation of petroleum products:

At present the most convenient route for transporting finished products in Zambia is the Dar-es-Salaam – Ndola corridor. On the other hand it would be cheaper to transport finished products by rail. However, a number of constraints in the

railway system have led to the more expensive option of road transport being used for transportation of refined petroleum products into the country. Challenges in the rail sector include issues such as inadequate wagons and locomotives and the general poor state of the railway infrastructure.

Indeni Oil Refinery:

Indeni Petroleum refinery is a 20,000 barrels per day (b/d) simple hydro skimming refinery and is the only refinery in Zambia. The feedstock once refined produces petrol, diesel, Kerosene and heavy fuels. However, the refinery in its current configuration cannot process pure crude or produce Low Sulphur Gas Oil (0.05% or 500ppm). The refinery was designed to operate on a spiked (mixed) light crude oil which contains crude oil, condensate, diesel, and naphtha. Indeni Petroleum Refinery would have to be fitted with a

hydrocracker and desulphuriser unit in order to process other types of crude and produce Low Sulphur Gas Oil (LSGO). At the moment the country imports all its LSGO requirements.

Ndola Fuel Terminal:

Ndola Fuel Terminal is a bulk storage facility where the product refined at Indeni or imported into the country is stored before being uplifted by the OMCs for distribution to their customers and retail sites. The terminal has a total of 11 tanks one of which is a recently rehabilitated above storage tank with a capacity of 40 million litre. This tank which has not been used before will be used to store strategic reserves of diesel which can meet 30 days of national demand. The Ndola Fuel Terminal is however in need of maintenance and rehabilitation to improve its technical, safety and environmental conformance to industry standards.

OMCs fuel depots

All Oil Marketing Companies (OMCs) are required to secure a minimum of 250,000litres storage capacity as a requirement for a distribution license. Some OMCs which do not have their own storage facility enter into hospitality arrangements with other OMCs that have excess storage capacity. This arrangement is only valid for two years during which an OMC is expected to build its own storage facility. The combined storage capacity owned by the 23 OMCs operating in Zambia is 11,795litres for petrol and 22,066litres for diesel. The main sources of concern with regard to bulk storage, is poor compliance with technical and environmental requirements. In addition, Government also has about 7.01 million storage capacity in various facilities dotted around the country. However, most of these are in need of rehabilitation and few are functioning.



Inspecting storage tanks at Kapiri Mposhi

Retail sites

By 2008, there were a total of 220 filling stations in Zambia. All OMCs were required to comply with technical requirements outlined in ZS 385 Part 3 - The installation

of underground storage tanks, pumps, dispensers and pipe work at filling stations. Areas of concern centered around safety technical and environmental issues. The Regulator is in the process of carrying out enforcement action against erring OMCs.

Ndola Fuel Terminal



Consumer Complaints Column



In view of some outstanding complaints, the ERB held meetings with ZESCO on the Copperbelt during the last quarter of 2009. Some issues which had been outstanding were rewiring of houses in the former mine townships in Kitwe. The utility is required to upgrade the current power system in the mine township areas as they are deemed unfit and obsolete having been installed decades ago.

Complaints reported to the regulator for the period September to December 2010 were 33 for the Southern Region and 164 for the Northern part of the country. Billing problems continued to be the highest number of complaints reported. Most complainants were those on fixed charge who were complaining about standard bills regardless of load shedding or power disruptions. The good news however is that billing complaints though the most common are usually promptly

resolved compared with other types of complaints such as new service connections which in some instances have dragged for as long as two years. It has also been observed that billing complaints reduce in areas where prepaid meters have been installed.

In addition consumers are advised to inform the regulator whenever ZESCO wants to change the bill to the consumer's disadvantage. There was an increase in the number of disconnection cases in Kitwe reported to the regulator in the last quarter of 2009. ZESCO disconnected some consumers who had not rewired their houses during the agreed timeframe. However this issue was resolved and power was restored with intervention from the regulator. The regulator's role is to protect the interests of consumers while ensuring that the utility gets a return on its investment. As such reported

cases are addressed but at the same time consumers are advised to meet their obligations such as paying bills on time.

Most of the complaints received in the southern and Northern regions were against ZESCO. However there was a complaint against North-Western Energy Corporation in Lumwana with regard to high tariffs being charged by that utility. The utility was advised to request for approval of the proposed electricity tariffs and has since applied for a tariff review.

The petroleum sector characteristically, had a negligible number of complaints reported at six complaints against the 197 reported to the ERB. These were related to quality product.

Received Vs. Resolved Sep to Dec 2010

Received Vs. Resolved Sep to Dec 2010

CATEGORY	No Received	No Resolved	Unresolved	Resolution Rate %
Billing	34	11	23	32
Power Outages/Load shedding	4	3	1	75
Delayed New Service Connection	4	0	4	0
Security Deposit	0	0	0	0
Disconnection	9	6	3	67
Fuel Contamination	2	0	2	0
Low Voltage	131	0	131	0
Metering	2	2	0	100
Compensation Claim	3	0	3	0
Other-Electricity	2	2	0	100
Other (Service Personnel)	2	2	0	100
Fuel hoarding	4	4	0	100
TOTAL	197	30	167	15

ERB establishes 10 Consumer Watch Groups

The Energy Regulation Board in the last quarter of 2009 established 10 Consumer Watch Groups (CWGs) in eight provinces in Zambia.

The new CWGs have been established under the ERB with a mandate to address energy concerns. The CWGs have been established in 10 districts namely, Lusaka, Ndola, Kitwe, Chingola, Chipata, Mansa, Livingstone, Kasama, Solwezi and Kabwe.

Western Province already had a CWG in place which was established under the Regulatory Alliance. The CWG was however adopted by the ERB after the Regulatory Alliance disbanded the existing CWGs.

During the selection of CWG members, the ERB received several applications from each of the towns mentioned above. The selection of CWG members was done through interviews for candidates who met the necessary requirements. The selection process ensured that CWGs are composed of members from all sectors of the society.

After the selection of the CWG members, induction workshops were conducted for all the CWGs in order to orient them on the role and mandate of the regulator and the utilities, obligations and rights of consumers, the role of CWGs and other stakeholders in the energy sector, among other issues.

Members of the public are encouraged to make use of their local CWG to address issues of concern or register energy related complaints. Details of the CWGs are as indicated in the table below:



Newly inducted Consumer Watch Group members

Town	Name	Position	Contact #
Lusaka	Pelani Ndovi	Coordinator	0955 /0966 800088
	Kenneth Mulwanda	Secretary	0976 185969
Livingstone	Paul Banda	Coordinator	0977 625679
	Grobby Muleya	Secretary	0955389612 / 0977389612
Chipata	Dancan S. Tembo	Coordinator	
	Martins N. Njekwa	Secretary	0955916052 / 0977767584
Kabwe	Charles Mwachunga	Coordinator	0977/0966 529635
	Stanley G. Mwelwa	Secretary	0977 341667
Mansa	Henry M.Chansa	Coordinator	0977891045 / 0955891045
	Jonathan Mwenya	Secretary	0977249001/ 0968622962
Kasama	Rev. Mpundu Chanda	Coordinator	0977 351991
	Jacob Shawa	Secretary	0966 324085
Kitwe	Melissa Chinyemba	Coordinator	0966955426
	William Kamanga	Secretary	0977443493
Ndola	Chikaiko Phiri	Coordinator	0977 520129
	Nsamwa Phiri	Secretary	0979 248409/ 0967 248409
Chingola	Florence Wamunyima	Coordinator	0966375547/0966562689
	Charles Kambilombilo	Secretary	0966853132
Solwezi	Lawrence Mulota	Coordinator	0979 525250
	Timothy Mulusa	Secretary	0977 344978
Mongu	Mwiya Katukula	Secretary	0977418028

Electrical Safety

By Gerald Chisongo

Electricity is an integral part of today's modern world, and sometimes it is easy to forget just how dangerous it can be. It is a well known fact that electricity is essential to everyday life, both at home and on the job. Perhaps because it has become such a familiar part of daily life, most people don't give much thought to it or how much our work depends on a reliable source of electricity. More importantly, people tend to overlook the hazards that electricity poses and fail to treat it with the caution it deserves. When used wrongly, electricity can kill. It can also shock painfully, damage sensitive equipment, and ignite combustible materials. Often referred to as a "silent killer", it cannot be tasted, seen, heard, or smelt. It is essentially invisible.

In some industries, electricity has long been recognized as a serious workplace hazard, exposing employees to electrical shock; which can result in electrocution (death), serious burns, or falls that result in additional injuries; as well as flash burns. It has been observed in Zambia, for example, that the majority of accidents in the Electricity Supply Industry involve electrocution and this is more frequent during the rainy season than the dry season. Several people are injured or killed each year due to inadvertent contact with energised conductors. Some employees work with electricity directly as part of their everyday jobs while others work with it indirectly, primarily by the use of cord and plug-connected equipment and tools.

Electrical Shock

A basic understanding of the shock hazard, along with its physiological effects on the human body, is vital to an understanding of electrical safety. Electrical shock occurs when a person's body completes the current path between two energised conductors of an electrical circuit or between an energised conductor and a grounded surface or object. Essentially, when there is a difference in potential from one part of the body to another, current will flow. The effects of an electrical shock can vary from a slight tingle to immediate cardiac arrest. The severity depends on several factors:

- Body resistance (wet or dry skin are major factors of resistance);
- Circuit voltage;

- Amount of current flowing through the body;
- Current path through the body;
- Area of contact; and
- Duration of contact.

There have been many studies performed in this area with different values of current that cause each effect. Table 1 illustrates average values of current and their effects. The values listed are average values and are not meant to provide specific effects for every person.

Table 1: Effects of Current on the Human Body

Current	Effect
1 mA	barely perceptible
1-3 mA	perception threshold (most cases)
3-9 mA	painful sensation
9-25 mA	muscular contractions (can't let go)
25-60 mA	respiratory paralysis (probably fatal)
60 mA or more	ventricular fibrillation (probably fatal)
4 A or more	heart paralysis (probably fatal)
5 A or more	tissue burning (fatal if vital organ)

The best way to avoid exposure to electrical hazards is to STAY OUT OF THE CIRCUIT or to keep as far away as possible from electrical equipment and systems that have exposed live parts or where the electrical equipment is being operated.

Most electrical accidents result from one of the following:

- Unsafe equipment or installation,
- Unsafe environment, or
- Unsafe work practices.

Investigations into these accidents have identified some of the causes of injuries and fatalities which point to several contributing factors such as:

- Faulty insulation;
- Improper grounding;
- Loose connections;
- Defective parts;
- Ground faults in equipment;
- Unguarded live parts;
- Failure to de-energise electrical

- equipment when it is being repaired or inspected;
- Intentional use of obviously defective and unsafe tools; and/or,
- Use of tools or equipment too close to energised parts.

Additionally, electrical accidents at jobs are largely preventable through safe work practices. Examples of these practices include, but are not limited to, the following:

- De-energising electrical equipment

- before inspection or repair;
- Keeping electrical tools and equipment properly maintained;
- Exercising caution when working near exposed energised lines and equipment; and
- Using appropriate personal protective equipment and insulated tools.

Electrical Safety at Home

It's easy to practice electrical safety. Remember that electricity always takes the shortest way to the ground. It will go through wire, metal, wet objects... OR YOU! It's invisible, but very real, so treat it with caution.

Wires run around, through and over our houses. And, each year people are electrocuted in their homes and others are injured in electricity-related accidents, accidents that can be prevented with a little foresight.

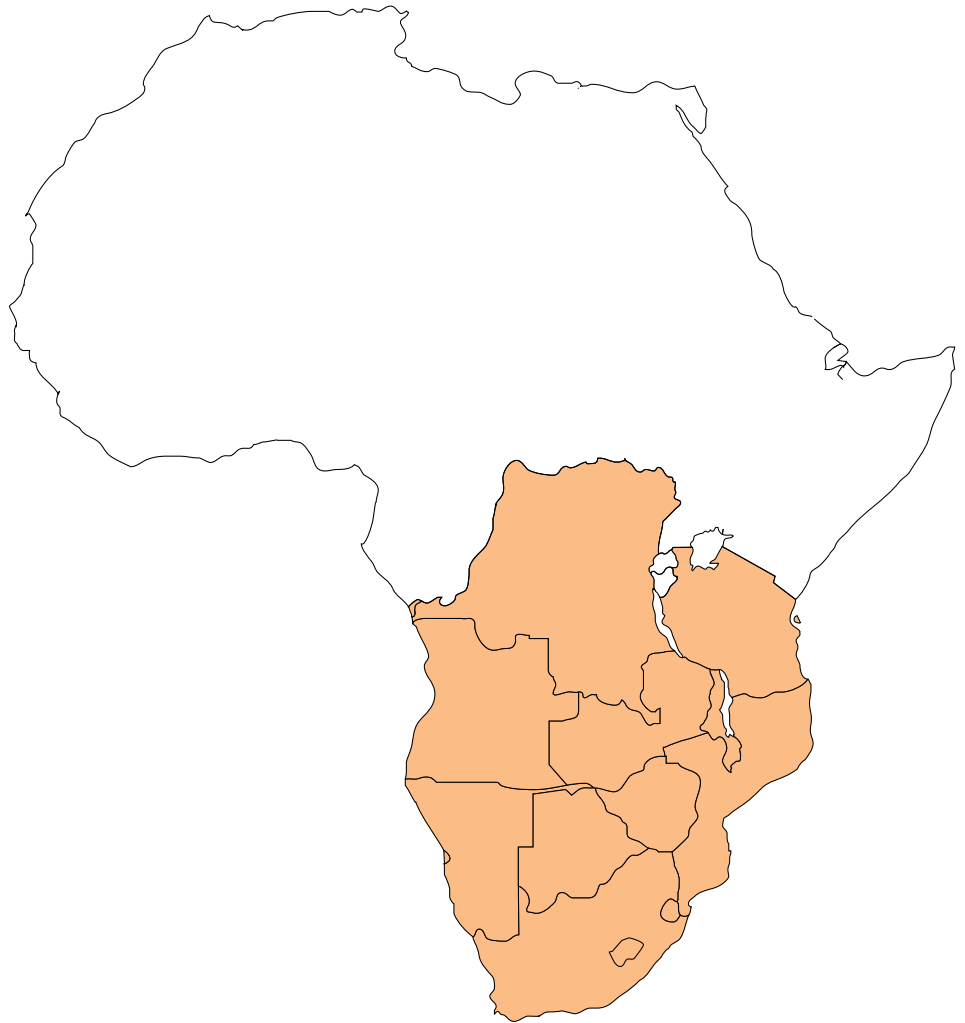
South Africa is the new RERA Chair

The Regional Electricity Regulators Association of Southern Africa (RERA) held its annual general meeting on 20th November 2009 in Pretoria South Africa. Member countries from the Southern Africa region attended the meeting which also ushered in a new Chair for the association. South Africa was selected as the new Chair for the association taking over from Zambia, for a two year term.

The ERB, represented by then Executive Director Mr. Sylvester Hibajene for most of its tenure, was RERA chair for two consecutive terms from 2006 to 2009.

At the November 2009 meeting members were updated on a number of activities conducted under RERA which included a regional workshop on energy and environment partnership in Southern Africa. The main objective of the workshop was to contribute to the regional sustainable development and mitigation of the global climate change. The partnership is scheduled to commence in 2010 after approvals by sponsors. It was also disclosed at the meeting that as at 16th November 2009, eleven out of 15 SADC countries had established regulators all of whom are members of RERA except for Madagascar and Swaziland.

There was also a meeting held at the request of ESKOM, the South African electricity company for an update on the Southern African Power Pool (SAPP) plan. In addition RERA made a presentation to the COMESA-EAC-SADC conference on the Lower Kafue Hydro Power Project and the Zambia – Tanzania Interconnector. Ministers from the countries involved at this meeting made a commitment to implement initiatives like cost



RERA member countries

reflective tariffs in order to attract investment, while the international community pledged to support development of energy sectors in the three regions.

RERA was also represented at a World Bank organized workshop in Maputo to create a pool of practical information and a network of Sub-Saharan African practitioners in the design and implementation of rural, peri-urban and urban on-grid and off grid electrification programs. The main objective for RERA as a

regional body is to build capacity, share information, facilitate harmonization of Electricity Supply Industry policy, legislation, regulation and promote regional regulatory cooperation. Areas of focus for RERA for 2010 are: improving the regional investment climate in the power sector; developing an enabling regulatory environment for access to and operation of a viable regional electricity market and enhancing the capacity, image, credibility and performance of RERA.



Conducting a research to collect statistical information

Importance of Statistical Information

By Ian Siluyele,

People receive large quantities of information every day through conversations, television, the radio, newspapers, posters, notices, etc. A motorist approaching a major road absorbs a lot of information in form of road signs, direction indicators on the flow of traffic, and when they fail to do this, accidents are bound to occur.

Due to the abundance of information it is necessary to select and sift through facts and

information that is useful at any one time. In day to day functions, information is necessary and it is important to know where to find it and how to collect it.

As a study, statistics is a scientific method of collecting, organising, summarising, presenting, and analysing data, as well as drawing valid conclusions in order to make reasonable decisions.

Statistics is the systematic collection of quantitative or qualitative data and its

interpretation. As a word, it is used usually to refer to numerical facts, such as the number of service stations in Lusaka in 2009. Arguably, figures are not facts in themselves. It is only when they are interpreted that they become relevant to a decision making process.

One can therefore say that the main function of statistics is to provide information which will help in making decisions. It can be argued that making some decisions without statistics

is asking for trouble. It is like asking a Doctor to diagnose a patient's illness without collecting information on the patient's condition such as temperature, pulse rate, blood pressure, etc. Statistics provides this information by providing a description of the present, a profile of the past and an estimate of the future.

Statistical data is much more available now than in the past, however, there is still a tendency to avoid numerical information in favour of written, visual or verbal information. Few newspapers publish volumes of statistics. Many publishers translate statistics into a verbal form. For example the headline 'High Unemployment but Consumer Boom Continues' is a statistical statement. It is an interpretation of employment and sales data.

THE USE OF STATISTICS

The principal function of statistics is to narrow the area of disagreement which would otherwise exist in a discussion and in that way help in decision making. Statistics can be used as a stabilizing force; to dispel rumours and uncertainties; and to help solve arguments arising from individual cases or circumstances by providing factual foundation to debate, a decision which would otherwise be dominated by subjectively based theories and opinions.

In recent years, the emphasis on statistics has shifted from a backward-looking process to current affairs and proposed future operations and their consequences. Currently, every Government department or business organization uses

statistics in its operations. As H.G. Wells¹ predicted nearly a century ago:

"Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."

Today the basic principles of statistical thought and reasoning are as necessary for the understanding of sporting events, as they are in conducting research. There are several specialized areas of statistics, namely, *time series analysis, forecasting, reliability and process control, linear modeling, risk analysis, probability theory etc.* However, our focus in this article will be on time series analysis (TSA) as most of the statistics available at the ERB are based on this.

TIME SERIES

A time series is a collection of historical observations of a variable such as consumption of fuel measured at regular intervals of time and arranged in order of time. The objective of TSA is to make predictions or forecasts of the future on an issue or item based on available historical data. There are two types of time series namely, discrete and continuous time.

Usually a large number of factors influence decision making in TSA. However, identifying and then measuring these factors is an impossible task because their importance changes over time, and new factors come into play from time to time. Although the factors that affect the future are uncertain, often the past offers a good indication of what is expected in the future.

¹ <http://cygnus-group.com/CIDM/stats.html>

ERB Statistics

The ERB compiles statistics from the energy subsectors of electricity and petroleum. The data available is predominantly time series statistics. They are usually reported at time intervals of day, week, month, quarter and year. Some of the time series statistics available at ERB, but not limited to the following, are:

- **Electricity subsector**
 - Generation sent out by hydro power stations;
 - Distribution losses;
 - Electricity consumption by sector;
 - Performance indicators for electricity supply industry;
 - Electricity imports and exports.

- **Petroleum subsector**
 - Compliance to license conditions;
 - Combined fuels stock positions
 - Volumes of fuel uplifted by Oil Marketing Companies;
 - National consumption of petroleum products;
 - Number of service station, commissioned and decommissioned;
 - Crude oil importation;
 - Retail prices for fuels;
 - Wholesale prices for fuels;
 - Crude oil prices at international markets; and
 - Export of finished petroleum products

The main sources of these statistics for the ERB are the utilities and investors in the energy sector. However, the challenge in compilation of the statistics is the degree of accuracy of some sources,

especially in the electricity subsector. For example, in the Fifth National Development Plan, installed capacity of the national power system is 1,876 MW while some reports from utilities put the figure at 1,822 MW. On the other hand, statistics from the petroleum subsector are fairly accurate and to some appreciable degree reliable.

Government departments, private organizations as well as individuals, interested in activities in the energy sector, have approached the ERB, formally and informally, seeking different types of statistical information. Recipients of the information have used it differently. Some have used it in the following way:

- Quantitative research;

- Assessing levels of competition in the sector;
- Monitoring and evaluation of investment in the sector;
- Assessment of market contribution and leadership by stakeholders;
- Assessing opportunities for investments in the energy sector;
- Assessing the potential clientele for loan facilities in the sector;
- Influencing policy decisions in energy provision;
- Assessing opportunities for diversification into other form of energy products; and
- Assessing the size and growth potential of the sector

In conclusion, the importance of numbers and statistics to the modern world cannot be

overemphasized. In his book *"How to Think About Statistics"*, author John L. Phillips puts it succinctly: "The culture of any industrialized society is suffused with quantitative information. Some quantitative messages are simple and direct; others involve a relatively complicated process of inference. Knowing how to think statistically makes possible the comprehension of both."

In *"Statistical Deception at Work"*, John Maura writes, "If you cannot understand simple statistics, you can be fooled by news stories, advertisements and daily encounters with other people. You are likely to be taken in by modern-day medicine men who are out there seeking ways to dupe unsuspecting individuals into becoming their agents."



Information dissemination using television

Choosing the right lubricant

By Johnstone Chikwanda

In the first article on this column the subject of lubrication was introduced. A lubricant was defined and its function illustrated. It was stated that the main function of oil is to reduce friction, remove heat and to clean the interior parts of the application. In hydraulic systems, hydraulic oil delivers displacement or movement of a load from one point to another. The gist of this article is to explain the fundamental composition of a lubricant. There are many types of lubricants depending on their composition. Engine oil has properties that are different from those in hydraulic oil. The composition or makeup of a lubricant is extremely crucial. Every lubricant is intended to deliver a certain performance and stability.

A lubricant has two fundamental packages: Base oil and an additive package. Base oil is a derivative of crude oil or synthetic liquids. Typically, lubricants contain about ninety percent base oil (most often petroleum fractions called mineral oils) and less than ten percent additives. Vegetable oils or synthetic liquids and many others are sometimes used as base oils. Since a base oil has the largest percentage contribution in a lubricant, it can be regarded as the host.

An additive package that is introduced into the host serves to either enhance valuable properties or to undermine or suppress unacceptable properties. Furthermore, an additive may seek to introduce new desirable properties. In other words, additives are used to enhance the performance characteristics of the base oil. Different applications require different lubricants. Since the source of base oils is the same (crude oil derivatives and synthetic liquids), what distinguishes lubricants is therefore the additive package. The additive package is sold by highly specialized companies and is quite expensive. It is this package that is critical and forms formidable cost line



One of the oil lubricants available in Zambia

in pricing of lubricants. The quality of an additive package will have an effect on the performance of your engine. As such, it is important to ensure that the lubricants you purchase are sourced from ERB licensed undertakings that are mandated to ensure that they comply with minimum quality standards.

One of the most important properties of any lubricant is viscosity. In simple terms, viscosity is the ability of a lubricant to flow. It is highly sensitive to temperature. At high temperatures a lubricant tends to become thinner while at low temperatures, it becomes thicker. A lubricant is less viscous at high temperature, and more viscous at low temperatures. An additive called viscosity index improver is introduced in a base oil to reduce its tendency to change its viscosity with temperature. Zinc additives are added to lubricants to provide wear protection and help inhibit oxidation. Oxidation is a nemesis of a lubricant. It is the most predominant chemical reaction experienced by a lubricant in service, accounting for significant lubricant

problems. Oxidation is the major source for viscosity increase, varnish formation, sludge and sediment formation, additive depletion, base oil break down etc. Controlling oxidation is therefore a major concern. It takes an additive to achieve this. Unfortunately you cannot tell if your oil has this property with the naked eye. That's why your comfort should be in buying lubricants from reputable sources.

There are many additives with varying significance and cost structures. They all carry a particular important message. Other than antioxidants and anti-wear agents, there are also detergents. It has been stated before that one of the functions of a lubricant is to clean the interior surfaces. A lubricant manages to have cleaning properties because of a detergent additive. As a lubricant is flowing, not only should it clean interior surfaces but it must sweep and lift wear debris, sludge, other contaminants and carry them in the flow to the sump or reserve tank. It takes an additive to do this. The better the quality and quantity, the better the job, and, the better the job, the more savings for YOU!

Another additive to the lubricant is an anti-foaming agent which enables the lubricant to remain in place during metal-to-metal contact. A lubricant, especially one meant for the gear box must maintain a layer in between two surfaces no matter the pressure exerted upon it by two meshing gears. If it cannot maintain a layer in between, wear and tear of gears will result. To safeguard your interest, experts have come up with an additive called extreme pressure (EP) additive. This additive delivers high stability and ensures your oil remains in place when under pressure. For certain applications, pressure in the gear box is different from pressure in the differentials. Therefore, where this is the case, avoid using gear box oil in the differentials unless the lubricant type is multipurpose gear oil.



Newly installed canopy at Mount Meru Nakonde filling station

Typical Safety incidents in the Zambian Petroleum Industry – Filling Stations and Fuel Tankers

By Allen Polito

In this article, we look at some of the measures taken by the ERB to ensure adherence to safety standards.

1.0 MOUNT MERU - R S CHAULA NAKONDE FILLING STATION – CANOPY INCIDENT

Following a complaint received by the ERB concerning Mount Meru's unsafe operations at its R S Chaula station in Nakonde, the ERB directed Mount Meru Petroleum Limited to cease retail operations

at the said site on 26th May 2009. This was in pursuance of the ERB's mandate to safeguard the interests of all stakeholders with regard to enforcement of infrastructure safety standards in the petroleum industry. The closure was as a result of a shaky canopy at the station which posed a risk to the safety of filling station workers, motorists and the general public.

Mount Meru was further directed to ensure that they engaged a

duly registered and competent engineering consultant to carry out assessments as well as erect a properly designed filling station canopy. The company consequently contracted *Despro Engineering*, a Lusaka based engineering firm to undertake assessments of the canopy.

The consultant recommended that the canopy should be pulled down and a properly designed one erected. Subsequently, a new canopy was

successfully designed and installed at the Mount Meru Nakonde filling station under close supervision of Despro Engineering. The Mount Meru RS Chaula filling station resumed retail operations in August 2009 after verification inspections by the ERB.

2.0 CHEVRON CHIBULUMA ROAD FILLING STATION, KITWE – CANOPY INCIDENT

On Saturday, 24th October 2009 a foreign registered truck hit into the canopy at the Chevron Chibuluma Road filling station. The canopy was extensively damaged and posed a safety hazard to the employees and the general motoring public.

The ERB therefore directed immediate suspension of all sales of petroleum products, until the safety issues pertaining to the canopy were resolved and verified by the ERB. Chevron has since been directed to ensure that they engage a competent and registered consultant to work on the installation and certification of a new canopy. The Chevron Chibuluma Road Kitwe filling station remained closed as at 31st December 2009.

3.0 FUEL TANKER ACCIDENT – CHINSALI

A Tanzanian registered fuel tanker carrying about 33,000 litres of diesel bound for the Ndola Fuel Terminal collided with a Zambian registered passenger bus in Chinsali District. The accident occurred at a place about 140 kilometers from Mpika and about 30 kilometres from Chinsali in the early morning of Tuesday, 10th November 2009. Eye witness accounts place the time of the accident to be around 05:00 hours. The bus and horse for the fuel tanker were severely damaged, but no fuel was spilled. Sadly, several lives were lost as a result of the accident.

4.0 LEARNING POINTS FOR THE ZAMBIAN PETROLEUM INDUSTRY

In view of the above incidents, the following key lessons ought to be kept in mind by operators in the petroleum sub-sector:

1. All licensees should ensure that works at all energy installations are undertaken and supervised by registered and competent relevant consultants as stipulated in applicable petroleum industry standards.

2. From the Chinsali Fuel tanker accident, the following salient points that are relevant to the Zambian Petroleum Industry as defined in the Zambian Transportation of Petroleum Products Standard - ZS 372: *Operational Requirements for Road Tanker Vehicles – Code of Practice*

i. Adherence to “Movement Time” of fuel tankers of between 06:00 and 18:00 hours

Incidents of this nature, if not due to the fault of the tanker driver, can also be caused by another road user, hence it is safer to move when there is sufficient light to ease vehicle maneuvering when in a tense situation

ii. Adherence to “Time Limits for Driving” for fuel tanker drivers

This will ensure that tanker drivers receive adequate rest and are not fatigued as they can become a danger to themselves and other road users.

The ERB will not hesitate to punish licensed undertakings found flouting these standard provisions

Damaged canopy at Chevron Chibuluma Road Kitwe filling station



Mission Statement

To regulate the energy sector in a transparent, effective and efficient manner that safeguards the interests of all stakeholders.



ENERGY REGULATION BOARD

“We safeguard your interests”