DETERMINANTS OF FUEL SUPPLY COSTS IN UGANDA

Consultative Draft Report – Not to be cited without permission of ERA

June 2008

This study was initiated and conducted by the Electricity Regulatory Authority (ERA) in conjunction with the Ministry of Energy and Mineral Development.

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Glossary of acronyms and abbreviations

AGO	Automotive Gas Oil
CIF	Cost Insurance and Freight
C&F	Cost and Freight
DRC	Democratic Republic of Congo
EAC	East African Community
ERA	Electricity Regulatory Authority
FOB	Free on Board
FOT	Free on Transit
HFO	Heavy Fuel Oil
JST	Jinja Storage Tanks
KOSF	Kipevu Oil Storage Facility
KPA	Kenya Ports Authority
KPC	Kenya Pipeline Company
KRC	Kenya Railway Company
LFO	Light Fuel 0il
MEMD	Ministry of Energy and Mineral Development
MT	Metric Tons
MW	Mega Watts
PDC	Professional Development Consultants (LTD)
PPA	Power Purchase Agreement
RVR	Rift Valley Railways
UETCL	Uganda Electricity Transmission Company Limited
UNBS	Uganda National Bureau of Standards
URC	Uganda Railway Corporation
TRC	Tanzania Railway Company
TOR	Terms of Reference
WENRECo	West Nile Rural electrification Company Ltd

EXECUTIVE SUMMARY

Introduction and Objective of the study

Over the recent years, Uganda experienced electricity supply shortages largely caused by the decline in hydro-generation as a result of persistent drought that hit most of the country which lowered the water levels of Lake Victoria. These shortages have been exacerbated by the lack of generation "reserve margin" and inelastic generation capacity. In order to address this power supply problem, government has procured thermal generation using diesel. In May 2005, 50 MW of diesel (AGO) based generation was commissioned at Lugogo and in December 2006 an additional 50 MW was commissioned at Kiira under short term contracts. There are now plans to replace these expensive AGO based generators with heavy fuel oil (HFO) based generation.

The licensing process requires that ERA approves the Power Purchase Agreement (PPA) between the generation company and the "off taker" who is the transmission company. Among the aspects of the PPA that the regulator approves, is the pricing methodology. ERA is expected to review the pricing framework proposed in the PPA's to ensure that the consumers do not pay for unreasonable costs. Unlike hydro generation, the major input into the production process of thermal power is diesel fuel.

This study was commissioned by the Electricity Regulatory Authority to establish appropriate benchmark data for fuel costs and to provide an understanding on fuel cost logistics in Uganda, upon which reviewing the reasonableness of fuel costs proposed by thermal generators can be based.

This study was done by identifying: the fuel supply process, key players, and methods of fuel purchase at various stages in the supply chain. The study team comprised of team members[1] from ERA, MEMD and coordinated by an independent consultant for putting the report together. The study approach involved interviewing key stakeholders in the industry that included power generators, transporters of fuel products and oil companies. It also involved a review of literature and collection of secondary data from the Ministry of Energy and Mineral Development (MEMD). Key findings and policy conclusions are presented and discussed below.

Main Conclusions

i) The report shows that the demand for HFO and other oil products is projected to continue increasing for the years to come mainly due to the increased use of HFO in generation of electricity, increased economic activity and the associated increase in number of cars. The demand increase would suggest a need for a strategy to develop storage and transport facilities to accommodate the demand. Therefore, the use of HFO for thermal generation will depend on the availability of new facilities for storage and transportation.

ii) Transporters are confident that they can meet the logistics of the growing demand. However truck registration expenses and associated constraints, lack of tax incentives for investors in the sector continue to limit the growth and development of the sector. The rail transport, on the other hand, which is a cheaper means of transporting oil products is still highly inefficient. The EAC partners should reexamine the whole privatization process of the rail system and address the inefficiencies. Without functioning ferries the Tanzania route and the Rail – Kisumu route would not be an efficient supply route of oil products. It involves time loss as a result of delays in connecting the rail system with the ferry system for quick delivery.

iii) Limited storage facility for LFO and HFO exists in the country. At least for LFO, storage capacity exists at the oil company depots in Kampala, Jinja and Mbale.

[1] For a complete list of study team members see appendix 2.

Many of the small retailers do not have adequate storage capacity. Existing storage and transportation logistics for diesel is fully committed to meet current consumption levels. The limited HFO storage facilities are located at the customers site.

iv) While the transporters and the fuel suppliers could previously enter into long term contracts with fixed transport charges only renegotiated after the diesel pump prices have increased by 5-6%, the recent sharp increases in prices of petroleum products have forced the transporters to renegotiate these contracts with an intention of making transport charges a variable cost with well established adjustment formula. The same applies to freight charges. However, at the time of this study, the industry was still renegotiating these issues.

v) It emerged that fuel suppliers as well as transporters are concerned that Uganda Electricity Transmission Company Limited (UETCL) does not guarantee generating companies a minimum off-take of their power. As a result, the generation companies are unwilling to guarantee a minimum fuel supply. Consequently, the fuel companies cannot guarantee a minimum turn-around for the road tankers. This raises an investment risk and as a result the companies are willing to recover their investment costs over a short period of time.

vi) The study has established that the logistics costs vary by type of transport and route. The ocean going/freight cost are estimated at US$49-60/tonne as at May 2008. The actual cost paid depends on the size of the shipment and the tenor of the contract. The logistics costs from Mombasa to Kampala excluding the company margin by road tankers amounts to US$120/cubic meter in the case of 4-axle road tanker and US$137/cubic meter in the case of 3-axle road tanker. The company margin/premium is in the range of US$10-20/cubic meter.

vii) The proposed legislation on changing from four-axle to three-axle trucks in all East African countries is likely to raise the transport costs by almost 15%. This is another reason why transporters are demanding that the transport costs become a variable cost adjustable every quarter.

Key Policy Recommendations

i) Consideration should be given to use government storage tanks in Jinja, as the industry moves to develop their own storage capacity. Presently the three tanks are holding petrol, diesel and kerosene. The kerosene tank could be decommissioned to hold diesel as well specifically to serve thermal generation efforts as more storage facilities are being planned or erected.

ii) Existing road fuel tankers are fully committed to meet current demand. However, transport companies visited have shown that they have capacity to enhance their road tanker transport fleet. They however need support in terms of reducing the costs of truck registration and be given tax incentives as given to other investors in the sector.

iii) To further enhance the transport sector, a review of the concessions in the railway system is needed urgently. Inspite of the privatization, government support in the areas of capital investments in locomotives and new wagons appear to be still desirable. Further to this, government contribution towards repair and investment in new ferry equipment on Lake Victoria is very crucial.

iv) There should be Government-to-Government discussions and agreements to minimize the non-tariff barriers such as impediments imposed by KRA policy on transit products within Kenya, constraints to being a KPC member for smaller companies and port handling services. The MEMD should urgently take action and organize bilateral discussions on key constraints highlighted in the report.

v) Efforts to construct the pipeline from Eldoret to Kampala should be speeded up.

vi) The generation companies should be allowed to enter into fuel supply contracts with oil companies which provide for quarterly adjustment of ocean freight and inland transport costs. The ERA, however, should ensure that the thermal generation companies seek approval of the fuel supply contracts from ERA before they are signed. In view of the fact that fuel related costs are a pass-through cost, the fuel supply contracts should be public documents and the consumers should be accorded an opportunity to provide comments on these contracts in a manners similar to Power Purchase Agreements (PPA's).

vii) Government should provide sufficient time before outlawing the 4-axle road tankers.

1. Introduction, Motivation and Approaches of the Study

1.1 Introduction

Over the recent years, Uganda experienced electricity supply shortages largely caused by the decline in hydro-generation as a result of persistent drought that hit most of the country which lowered the water levels of Lake Victoria. These shortages have been exacerbated by the lack of generation "reserve margin" and inelastic generation capacity. In order to address this power supply problem, government has procured thermal generation using diesel. In May 2005, 50 MW of diesel (AGO) based generation was commissioned at Lugogo and in December 2006 an additional 50 MW was commissioned at Kiira under short term contracts. There are now plans to replace these expensive AGO based generators with heavy fuel oil (HFO) based generation.

The licensing process requires that ERA approves the Power Purchase Agreement (PPA) between the generation company and the "off taker" who is the transmission company. Among the aspects of the PPA that the regulator approves, is the pricing methodology. ERA is expected to review the pricing framework proposed in the PPA's to ensure that the consumers do not pay for unreasonable costs. Unlike hydro generation, the major input into the production process of thermal power is diesel fuel.

In spite of the above, ERA currently lacks appropriate benchmark data of fuel costs in Uganda and this poses serious challenges when it comes to reviewing the reasonableness of fuel costs proposed by thermal generators.

The objective of the study therefore is to establish appropriate benchmark data for fuel costs with particular reference to fuel logistics costs. This is done by identifying: the fuel supply processes, and the costs associated with fuel supply at various stages in the supply chain.

1.2 Composition of the Study Team

This study has been jointly carried out by the ERA and the Ministry of Energy and Mineral Development (MEMD). The study team from both institutions included Mr. Benon M Mutambi (Director Economic Regulation, ERA), Mr. James Philip Sembeguya (STAT/IT Officer, ERA), Mr. Charles Baker (Economist, ERA) and Mr. Gerald Banaga (Senior energy Officer, MEMD).

In addition, a consultant Dr. Patrick Birungi was engaged to lead the above team. The consultant therefore led the team in data collection as well as report production.

1.3 Methodology

Different data collection methods were employed. These approaches included but not limited to key informant interviews, documentation reviews, and internal data analysis. The first part of the study involved the review of the relevant studies and any other relevant literature[2] with the aim of identifying: the different points within the supply chain, the key agents or market players e.g. importers of oil, Ministry of Energy and Mineral Development (MEMD), transporters, power generators, among others. After identifying the players, our approaches targeted identifying the costs at the different points in the supply chain by key players.

The study benefited from key informant interviewers with some of the largest oil importers. These were chosen because of their significant market size and also being the probable or already suppliers to power generators such as Aggreko, Jacobsen, Electro-maxx and West Nile Rural Electrification Company Ltd (WENRECO). Market sizes were established through document reviews and liaising with the Petroleum Supplies

[2] The main studies that were reviewed include;
Petroleum Development Consultants Ltd (2005), “Advisory Services for the Implementation of a New Regulatory Framework for Downstream Petroleum,”
PPA Consultants (2006), “Assessment of Short-term Generation Capacity Requirements in Uganda”
Nexant Limited (2001), “Kenya-Uganda Oil Pipeline Extension: Complementary Study”.

Department of the Ministry of Energy and Mineral Development which is currently regulating the downstream oil industry in Uganda.

As already indicated above, the study collected information on the different types of fuel products with particular attention to those that are commonly used or may be used in generating electricity in Uganda such as Gas Oil and Heavy Fuel Oil (HFO). The interviews were conducted in a manner that responses are collected with respect to each TOR to be addressed. The study in addition relied on secondary data collected from the dealers in the petroleum industry as well as key institutions such as Ministry of Energy and Mineral Development. Having an official from the Ministry of Energy and Mineral Development as part of the study team helped us to get a high response rate from the respondents, in addition to acquiring secondary information.

The common means of fuel transportation to Uganda include; road transport, railway transport, pipeline or a combination of these approaches. We are aware that the railway network has been a subject of reform and there have been plans to construct the pipeline to Uganda. In order to get a clear understanding of the fuel supply constraints, it was necessary to collect information on the progress with regard to concessioning of the railway sector, the progress of constructing the pipeline to Uganda and capacity constraints with regard to road transport.

2 THE FUEL SUPPLY CHAIN PROCESSES

2.1 Background

Uganda does not currently produce any petroleum products save for the newly discovered petroleum deposits in the Albertine region. The country imports refined products mainly from the Arabian Gulf region, Mediterranean and to a lesser extent from Singapore and South Africa. Given that Uganda is a land locked country, the ports of entry are either Mombasa or Dar es Salaam from where the products are transported to Kampala using many alternative routes.

It is however expected that Uganda will start its own production at Kaiso-Tonya (Mputa 1 Oil Well) by 2010. The expected daily production is about 4,000 barrels per day which will be used in and use the HFO produced locally to generate electricity. These discoveries and efforts will have implications on the supply logistics and processes discussed in this report.

2.2 The Procurement Process

Petroleum products are procured by the companies importing into Kenya or Tanzania from refineries throughout the region; Red Sea, Arabian Gulf, West Coast of India, European market and Singapore.

Procurement of cargoes for delivery into the Kipevu Oil Storage Facility (KOSF) at Mombasa for onward transportation by the KPC pipeline is handled by the KPC partners. This can either be on a single company or multi-company basis. Companies buy either from affiliates (in the case of the international majors) by direct negotiations or by means of an internal and international tender. The last form is used for industry pooled cargoes. Pooled cargoes are where, in order to optimise purchasing and shipping costs, one company buys on behalf of a consortium and the consortium splits the cargo and all pay the same price. For supply to KOSF Mombasa, each KPC partner can offer to supply the total group requirement and the lowest bid from a reputable company wins the supply.

Most of the Ugandan oil companies buy from big importers and independents in Kenya or import through their sister companies in Kenya since Ugandan companies are not KPC partners. Theoretically, the Ugandan companies are free to join the KPC shipper group in the KPC pipeline from Mombasa to Kisumu/Eldoret. Because of the requirement to contribute a share to the line fill, most Ugandan companies have found this a major barrier to entry. As a result, most Ugandan companies take title to the products at the loading points in Kisumu and Eldoret in Kenya (or at times of pipeline interruptions in Nairobi or Mombasa) or Mwanza in Tanzania. From these points, the onward supply is usually by truck but can be by rail tank cars and ferry or directly by rail.

The above method of procurement results into inefficiency and undermines the security of supply. These could be enhanced by allowing Ugandan companies to purchase their products as part of the buying consortium importing products into Mombasa. This would give Ugandan companies title and ownership rights over quantities of the product and they would not need to rely on Kenyan sellers who have to put their own interests first. The two governments are working to address this problem.

2.3 Supply Chain

2.3.1 Alternative Modes of Transport

Oil products in the region are distributed using two main routes that include the Northern and Southern corridors.

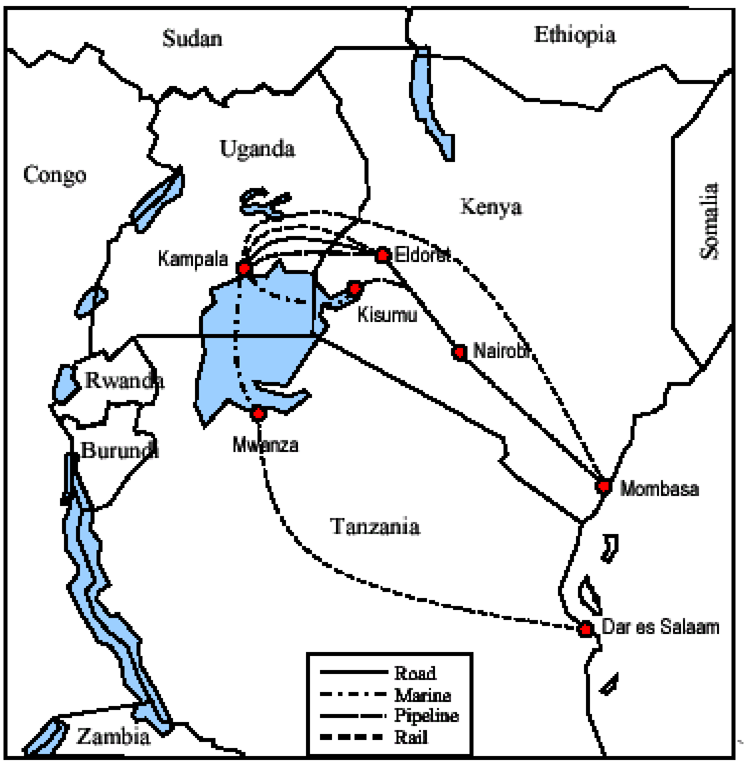
The Northern corridor serves Kenya, Uganda, Rwanda, Burundi, Eastern DRC and Southern Sudan through the Mombasa port. Due to depth constraints at the port entrance, the maximum ship size that can enter the port is 80,000 MT at the Kipevu Oil Jetty. 100% crude Oil and 70% of refined petroleum products in Kenya are imported based on an open tender system. The remaining 30% of refined products is imported by the individual companies. The imported refined products are first received into the Kipevu Oil Storage Facility (KOSF) that is owned and operated by the KPC. It has a storage capacity of 300,000 MT. The crude oil is refined at the KPRL, which has an installed capacity of 3.2 million tonnes per year but is currently processing 1.6 million tonnes per year. Both the imported refined products and part of those refined at the KPRL are then transported through the KPC pipeline. The other part is sold directly into the local market for the coast region. LPG, Fuel Oil and Bitumen from the refinery are transported by road and rail.

The Southern Corridor serves Tanzania, Uganda, Rwanda, Burundi and Eastern DRC through the Dar es Salaam port. Imported products comprising of 85-95% refined products are transported by sea and discharged through the Kurasini Oil Jetty (KOJ) at Dar es Salaam port. The balance is received at the port of Tanga. The maximum ship size that can use the KOJ is 40,000 MT. The products are then transported by Road and Rail. The storage facilities in Tanzania are located at Dar es Salaam, Tanga, Moshi, Arusha, Mwanza, Mbeya, Bukoba and Dodoma among other towns. The central railway runs from Dar es Salaam to Mwanza and branches at Tabora to Kigoma. Dar es Salaam is linked to Mwanza by road. Products to Uganda are transported across L.Victoria by ferries and barges from Mwanza to Port Bell and Jinja.

Therefore, the main transport routes include;

i) Pipeline to Eldoret/ Kisumu and then proposed new pipeline from Eldoret to Kampala.
ii) Pipeline to Eldoret/Kisumu and then by road to Kampala.
iii) Pipeline to Eldoret and then by rail to Kampala.
iv) Pipeline to Kisumu and then by Marine to Port Bell, Kampala.
v) Rail from Mombasa to Kampala
vi) Rail from Dar-es-Salaam to Mwanza, then marine from Mwanza to Port Bell.
vii) Road from Mombasa - Kampala.

Chat 2.1: Map showing possible transport mode



(a) Pipeline

At present, the oil marketing companies in Uganda transport the vast majority of their clean products via the pipeline. The pipeline runs from Mombasa through Nairobi, Nakuru, Eldoret and Kisumu where there exists storage facilities. Oil products to the rest of the region are collected from Eldoret, Nairobi and Kisumu depots and are transported by road. The pipeline has been experiencing constraints due to increased demand which exceeds its pumping capacity. To counteract this problem, a capacity enhancement programme is underway to double the flow rate for the line from Mombasa to Nairobi from 440 m^3 to 880m^3 per hour. In addition, a feasibility study for a parallel line from Nairobi to Kampala is ongoing. Plans to extend the pipeline from Eldoret to Kampala are underway and construction is expected to commence in mid 2008. There is a proposal to extend the oil pipeline from Kampala to Kigali and Bujumbura.

The pipeline is the most cost effective modes of product movement. Unfortunately, its capacity is currently limited and heavy fuel oil products can not be transported by pipeline.

(b) Rail

Two rail networks are used to transport oil products to Uganda. First is the Tanzanian Railway Corporation (TRC) which operates from Dar es-salaam to Mwanza on Lake Victoria. The challenge with this route is that TRC has resisted to be held accountable for extraordinary losses and leave the responsibility of cargo with the cargo owners (PDC, 2005). Secondly was the Kenya Railways Corporation (KRC) operated rail service from Mombasa to the ferry terminal in Kisumu. KRC in conjunction with Uganda Railways Corporation (URC) also operated a direct service from Mombasa to Kampala. After the concessioning of the KRC and URC, both companies are now managed under the same company called Rift Valley Railways (RVR). This arrangement and the associated concessions in the sector is expected to make the railway system more efficient, responsive and therefore cost effective.

Unfortunately, there is no evidence to date that efficiency has improved. Some oil companies have reported a turn around of one month for the Mombasa-Kampala route using the rail compared to a turn around of 10-12 days using the road tankers. This is not only too long but also erratic. Various stakeholders involved in the industry have indicated that the level of operations in RVR are lower than URC because RVR tends to concentrate more in Kenya where turn-around is highest. Another reported constraint is lack of locomotives that can pull up to 12 wagons of approximately 50,000 liters ($50m^3$) for light oil all the way from Mombasa to Kampala . In addition, the losses are quite high and RVR does not take the risk of loss.

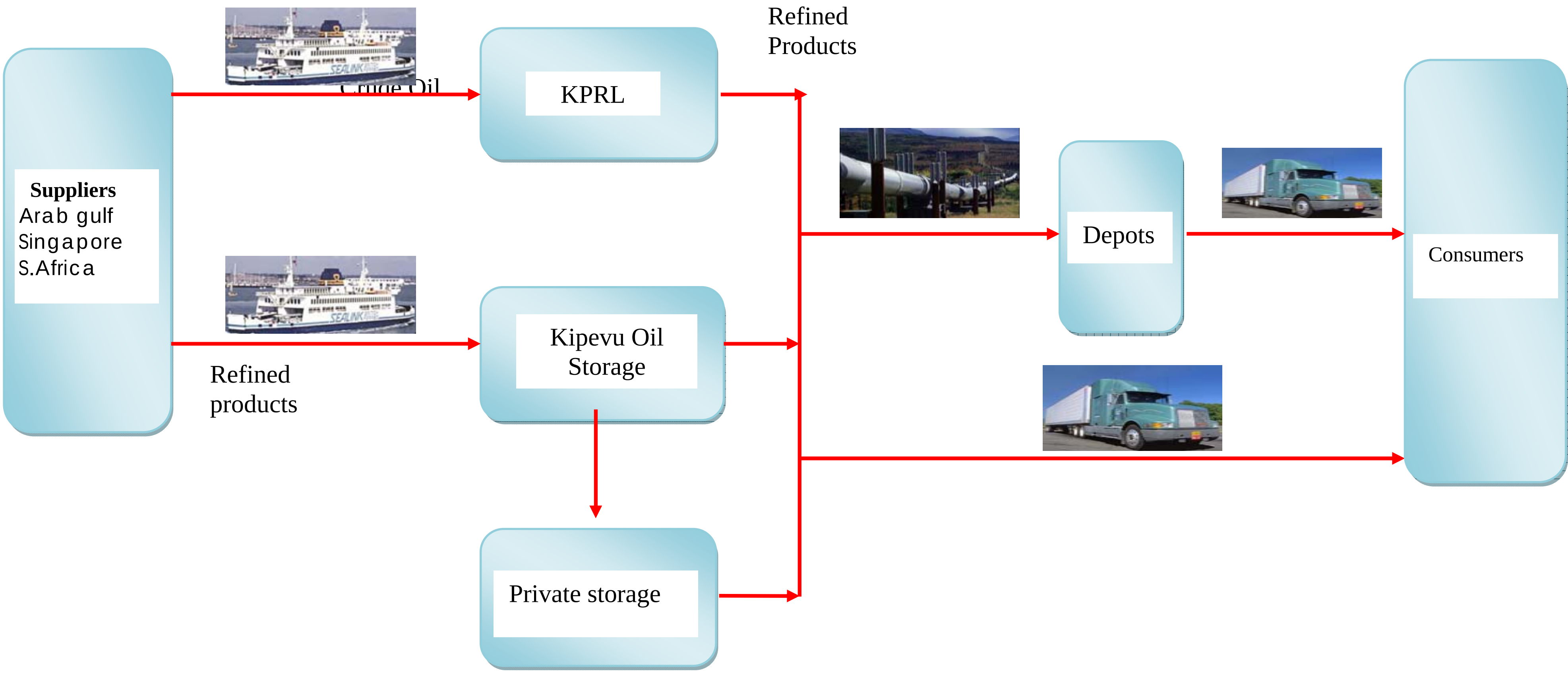
Minimal quantities of products are transported by rail from Mombasa to Kisumu in Kenya and from Dar-es-salaam to Mwanza in Tanzania, from where they are brought by ferry or barges to Port Bell in Kampala or Jinja. The problems associated with the ferry breakdowns have limited water transport on Lake Victoria. All the five marine vessels are not operational and water transport is currently dependent on the efficient operation of the TRC vessel on the lake. The TRC vessel itself is very old. However RVR (Kenya) has around 300 fuel oil tankers/wagons that used to supply to a number of mines in Tanzania that are currently idle. These are available and can be put to use in case of any increase in demand for fuel oil in Uganda. Revitalization and investment in the Railway sector would be very important in improving availability of oil products in the country.

(c) Road

Oil products are transported by road tankers from each of the loading points (Eldoret, Nairobi or Mombasa). While road transport is relatively more expensive, oil companies like it because of the limited loss through theft and evaporation. In addition, the turn-around is shorter compared to rail transport. Most of the roads are damaged with several potholes. An example is the Kisumu – Nakuru road and Jinja-Malaba road.

The costs of road tankers are relatively high and are variously quoted according to the quality of service. The more expensive haulage companies use good quality vehicles, well maintained and have backup options in case of breakdown. The challenges of using the road tankers include environmental and human costs of hauling oil products in bulk, damages to the road network, accidents involving transit vehicles, among others.

Chart 2.2 The transport chain of oil products from producers to final consumers in the Northern Corridor



Heavy fuel oil (HFO) which is a key input in proposed power generation sets, cannot be transported by pipeline. Even the tankers or rail wagons allocated to the transportation of HFO can not easily be used to transport other products. The most relevant mode of transportation of HFO therefore is by rail or road tankers all the way from Mombasa/Dar es-salaam. However, use of road tankers as a mode of transport is highly discouraged because of associated impacts on road infrastructure, accidents and general environmental protection standards. As a result of the impacts of road tankers on roads and environment, most East African countries are suggesting legislation to use of 3 axle trucks instead of 4 axle trucks. This proposed change in policy will have impacts on prices of products.

Regarding the availability of supply logistics to meet the demand for heavy oil, road transporters have indicated the ability to increase the road tankers. A number of these transporters would like to be guaranteed a minimum number of trips per month (three and a half trips per month). This is on top of RVR confirming idle capacity in terms of fuel oil wagons/tanks save for the locomotive problem highlighted before. It emerged that it takes about one month and a half to order for a new truck but transport companies would like to get tax incentives from Government.

2.4 Depot/Storage capacity

To ensure that disruptions in the fuel supply chain do not result in interruptions to electricity generations and thus the functioning of the entire economy, all importers of petroleum products are required to have access to depot facilities where the product is discharged. The depots are either company owned depots, hospitality arrangements by leasing space with other companies, or strategic storage hospitality in government storage facilities in Jinja.

The 2004 change in tax policy from assessing duty from depots to customs border entry points has significantly reduced the need for storage since product imports can now be directed to destinations such as those in the north and north-east without going through the depots in Jinja or Kampala. However, most demand for HFO is in Kampala and Jinja. There are no storage facilities for HFO and most companies do not have storage facilities. Oil companies involved in the importation of HFO in the country have in most cases established tanks on customer sites that could keep such companies running without supply for a week. These are small tanks and sometimes there is inadequate space for discharge by the transporters. As a result of lack of sufficient storage capacities by oil companies, transporters are sometimes inconvenienced as they fail to meet their expected turn-around because the trucks have to be held up at sites before discharge. These delays in discharge reduce the ability of transport companies to meet their expected number of trips and increase losses to the companies.

Our discussion with one of the licensed thermal generation companies revealed that they are planning to put in place a storage facility at their plant site to accommodate fuel equivalent to 15 days' consumption. However, the petroleum companies indicated that they build at least one week storage facilities at most company sites they supply with HFO. Lack of adequate storage capacity for HFO remains a major challenge for oil companies, expected users of HFO and the economy as a whole.

2.5 Challenges and Supply Logistics Constraints

Several challenges/constraints inhibit the expected flow of oil products into the Ugandan market;

i) Although Ugandan companies are permitted to be shippers in the KPC line from Mombasa to Eldoret and Kisumu, the requirement to contribute to the line fill is a major barrier to most oil companies in Uganda. Most Ugandan companies do not hold title to product in the line. This is extremely important as it effectively means that they have to rely on their Kenyan counterparts/affiliates for supplies. In times of general shortage, government pressure on the Kenyan companies will lead them to allocate more product to the Kenyan market at the expense of the

Ugandan market[3]. For companies without Kenyan affiliates this can lead to serious supply difficulties.

ii) The arrangements by KRA to make sure that trucks are escorted to the Ugandan Borders to avoid offloading in Kenya reduces the turn–around given that an already loaded truck has to wait for other trucks to load so as to move together. This is a serious non-tariff barrier.

iii) Though growing slowly, the petroleum supply operation supplying the Ugandan retail network is intrinsically inefficient due to the small volumes and large distances involved. For comparison purposes, the PDC report 2005 shows that the volume of Uganda's consumption was approximately 1/6th of that of Kenya. Yet distances covered are too long for Uganda. This leads to higher costs per unit because of lack of economies of scale. The long distance from Mombasa to Jinja/Kampala which represents the main area of consumption (but not the geographic centre of the country) is in itself costly and has significant implications on local product prices. The efficient functioning of the road and rail system is therefore critical towards cutting down the oil prices.

iv) The oil refinery in Mombasa-Kenya is too old and leads to inefficient oil product supply and primary distribution in the region. This is an old, simple distillation unit without a vacuum tower or any form of upgrading apart from hydro treating. This makes the products through this refinery expensive due to the inherent inefficiencies. For instance, the study by PDC (2005) shows that the product produced by refining crude oil at the Mombasa refinery is significantly more expensive than imported product of the same or superior quality. Pipeline from Mombasa to Nairobi is too old and has been weakened further by the pressure from the booster pump. This is likely to increase oil leakages. The possible

[3] At one point during the project it was noted that these problems required discussions at the highest political level between the Governments of Uganda and Kenya.

extension of the pipeline to Kampala is a good idea because it will reduce costs of transport.

v) The proposed legislation on changing from four-axle to three-axle trucks in all East African countries is likely to reduce the quantity of fuel carried by each road tanker from say 42,000 litres to 35,000 litres. This is likely to increase the costs of road transport.[4]

[4] Note that other than the number of tyres, the purchase cost of a 3-axle truck is almost the same as the cost of a 4-axle truck.

3. DEMAND FOR PETROLEUM PRODUCTS IN UGANDA

3.1 Key Factors to Consider

- **Oil and Gas Discoveries**

The discovery of oil and gas in the Albert Graben will affect current and future demand of oil. There are plans to establish a refinery to produce products for the local market as well as export. More exploration work is being undertaken and it is anticipated that more oil reserves will be discovered. This will undoubtedly lead to an increase the supply as well as the demand of oil products.

- **Growing Regional Market for Oil and Gas Products**

With the recent increase in number of member states from 3 to 5 in the East African Community, it is anticipated that the regional market for oil and gas products will also increase tremendously. The combined annual demand for the region amounts to approximately eight million tonnes. The regional economies are fast growing at an average of 5% real GDP growth rate and it is hoped that this will increase with the prevailing relative political stability. All the member states are promoting industrialization of their economies and this will in turn increase the demand for petroleum products in the region.

However, there are some existing challenges that are affecting the fast growth of the oil and gas industry in Uganda. These include;

- **Inadequate Infrastructure**

Uganda is a landlocked country and hence petroleum products have to be moved long distances by combination of pipelines, roads, water and railway system. This long supply chain presents numerous logistical challenges. The railway systems are inefficient and product losses are common. Most of the road infrastructure is not to standard and the turn around period of road tankers is long in addition to numerous breakdowns, accidents and insecurity. This inadequacy in road infrastructure has led to high cost of transportation and distribution of petroleum products.

It is important to note from table 3.1 that the demand for petroleum products has been steadily growing over the past two decades save for Kerosene and premium. The demand for gas oil has doubled since 2003 largely as a result of licensing generation plants using diesel and also as a result of more diesel consuming vehicles imported into the country. This growth in demand puts pressure on the supply logistics ranging from transport infrastructure, transport capacity, storage capacity among others. Analysis shows that the number of transport trucks with the capacity to transport $35m^3$ would increase at about 7.5 percent in order to meet the increase in demand.

Table 3.1: Annual Demand of Oil Products by Type (Tonnes)

Year	Premium	Kerosene	Gas Oil	Aviation	Fuel Oil	LPG	TOTAL
1994	118,521	25,090	79,701	33,711	16,212	693	273,928
1995	141,141	32,301	96,316	24,866	24,566	1,005	320,195
1996	154,510	34,771	99,478	33,286	29,468	1,420	352,934
1997	150,487	36,432	100,497	35,179	34,124	1,629	358,348
1998	163,180	44,631	119,623	47,838	39,384	1,977	416,634
1999	172,232	45,513	143,773	40,008	42,340	2,200	446,066
2000	161,893	42,122	149,821	31,687	36,087	3,082	424,692
2001	170,018	41,654	165,789	34,605	38,591	2,892	453,549
2002	173,003	68,271	156,292	31,733	32,391	3,116	464,806
2003	131,897	30,523	176,077	52,775	41,889	3,805	436,967
2004	158,342	37,005	208,782	62,356	53,313	4,500	524,298
2005	147,946	29,877	255,659	70,078	44,423	4,488	552,471
2006	168,407	32,173	333,959	70,916	38,289	5,800	649,544
2007	162,956	25,732	371,297	72,981	34,384	7,273	674,623

Source: MEMD.

Values for Premium, Kerosene, Gas oil and Aviation were provided in m^3 and were converted to tonnes using densities of 850kg/m^3, 750 kg/m^3, 800 kg/m^3, and 788 kg/m^3 respectively.

3.2 A Discussion of Key Drivers of Demand for Oil Products in Uganda

3.2.1 Number of Vehicles

According to the 2006/07 Background to the Budget, Uganda's economic performance has continued to improve over the years by an average growth rate of 5.6 percent for the past decade. As a result, the number of vehicles on Uganda's roads has rapidly increased since 2000, accompanied by an increase in demand for petroleum products. In 2007, petrol which is solely consumed by vehicles accounted for 24% of petroleum product sales, while gas oil which is largely consumed by both vehicles and other users accounted for 55 % in the same year. The number of vehicles is a key determinant of the level of demand for petroleum products.

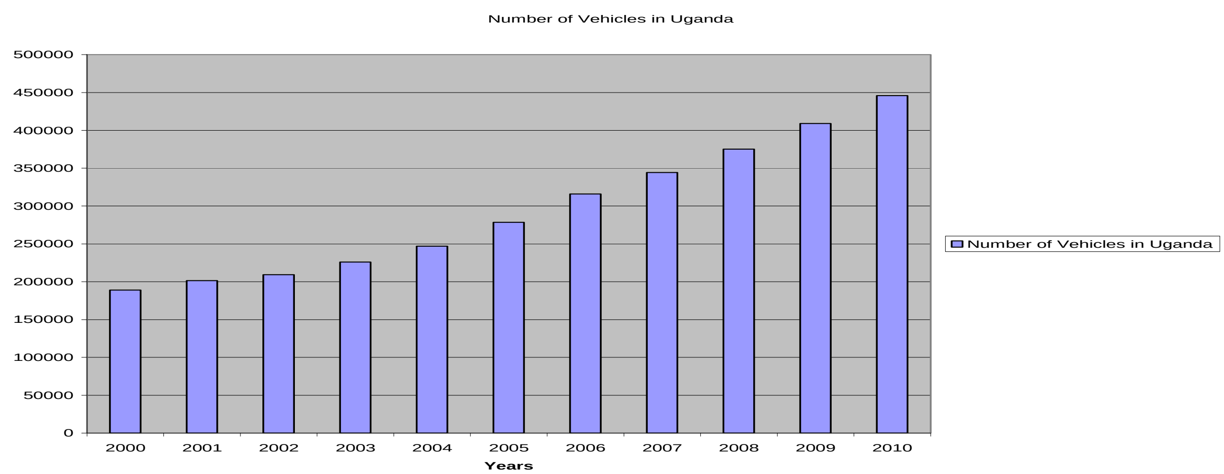
Table: 3.2. Number of Vehicles on Uganda's roads

Year	**Number of Vehicles in Uganda**
2000	189105
2001	201520
2002	209278
2003	226191
2004	247045
2005	278594
2006	315903
2007	344334
2008	375324
2009	409104
2010	445923

Source: UBOS; Statistical abstracts and projection calculations based on the growth rates

Table 3.2 shows the number of vehicles on Uganda's roads. The number of vehicles continued to rise and is projected to continue growing at an average growth rate of about 9%. The continued increase in the number of vehicles on Uganda's roads is a result of improved economic performance and improvement in people's welfare, which push up the demand for cars among other goods. This increase in demand for vehicles puts pressure on the supply logistics just like other demand pushing factors.

Chat 3.1. Number of vehicles on Uganda's roads



3.2.2 Power Generation

The use of diesel in electricity generation can have a significant impact on the demand for oil products. For example, it is estimated that a 50 MW HFO power plant will consume approximately 95,000 metric tons of HFO in a year. This is equivalent to increasing the current demand of heavy fuel oil in Uganda by three-fold and is equivalent to 26% of the current gas oil demand.

Due to the declining hydro generation as a result of the drought, Uganda procured 100 MW of diesel (AGO) based thermal generation on a lease basis from Aggreko Projects International Ltd, to mitigate the power supply shortfall. The first 50-MW was procured in May 2005 and an additional 50-MW were commissioned in November 2006. The first plant will be decommissioned at the end of August 2008 while the other 50-MW is due for decommissioning in December 2008. Also as part of the emergency generation plan, government with the financial assistance from the World Bank procured 50-MW of diesel based generation under a 3-year contract and this plant is expected to be commissioned by September 2008.

Government's short and medium term generation plans is to diversify the energy mix by replacing some of the expensive diesel (AGO) based generation with heavy fuel oil generators and also to promote renewable energy resources particularly the mini-hydro plants. So far, 50 MW of HFO based generation is due for commissioning by the end of August 2008. A Norwegian firm, Jacobsen electro was licensed by ERA to generate 50 MW at Namanve under a 6-year contract after which the plant reverts to government of Uganda. Government is also negotiating with another company to supply 50 MW of HFO as a replacement of the 50-MW diesel plant of Aggreko International projects whose contract is expiring in December 2008. Another plant of 10-MW using heavy fuel oil has also been licensed to operate at Tororo.

This implies that by the end of 2008, the capacity of thermal generation using heavy fuel oil will have increased to 110 MW while diesel (AGO) based generation capacity will be 50 MW. This implies an annual consumption of about 208,000 metric tones of HFO. However, in terms of the transport logistics it implies an increase in road tankers to meet an incremental demand equivalent to fuel supply for 60 MW of heavy fuel oil. It is assumed that some of the trucks currently used to transport gas oil will be converted to the trucks to transport HFO once some of diesel plants are decommissioned and replaced with HFO generation plants. Additional investments may be required to be done on these trucks if high sulphur (viscosity) fuel oil is to imported in order to provide for heating facilities.

The above implies an additional supply of 9,400 m^3 of diesel per month which requires about 78 fuel tankers dedicated for the purpose assuming a turn around of 10 days. The unit cost of a new fuel tanker is approximately $150,000. While the transporters indicated readiness to undertake these investments, the cost of the fuel products will likely increase as they demand for higher profit margins to recover the investment costs over a short period of time.

3.2.3 Projected Regional Demand

There is considerable growth potential among the Eastern African partner states.
The demand of the five East African partner states was 6 MT per annum in the year 2006. It is assumed that this demand will grow at the same rate as the GDP in each country. By 2030, the demand will be 20.6 MT per annum.

COUNTRY	**Demand (2006) Million MT**	**GDP Growth rate (%) projected to 2008**	**2010**	**2015**	**2025**	**2030**
Kenya	3.2	6.5	4.1	5.6	7.7	10.6
Uganda	0.8	6.5	1.0	1.4	1.9	2.6
Tanzania	1.7	7.5	2.3	3.3	4.7	6.7
Rwanda	0.2	4.6	0.2	0.3	0.3	0.4
Burundi	0.1	5.8	0.1	0.2	0.2	0.3
Total	6		7.7	10.8	13.8	20.6

Source: Country's baseline demand relate to the portion of demand supplied to the East African Partner States; IMF, 2008 GDP growth rate projections

4. BENCHMARKING THE FUEL SUPPLY COSTS

The appropriate way to establish the costing of fuel products is to establish the various cost centers in the supply chain. The various cost centers include;

i. The price of the product in the international markets which is best proxied by the platts.
ii. The ocean going freight, the premium and allowable losses.
iii. Port handling charges.
iv. Transport charges from the port of discharge to any destination in Uganda. The transport charges will largely depend on the mode of transport.
v. Other charges which may include the company's profit margin, border clearing costs, and Uganda National Bureau of Standards (UNBS) related charges.

On the basis of the findings of this study carried out in May 2008, these costs are presented in table 4.1.

4.1 Platts

The price in each of the international markets (Mediterranean, Singapore, Arab-Gulf etc) are collected and published by the Platts. The Platts publish the price of each of the petroleum products in US$/ Mton. It is the reference marker. However, the actual price at which the product is purchased from the international market depends on a number of factors namely;

i. The quantity purchased;
ii. The track record of the purchasing company (e.g its market size, reputation, financial position etc), and;
iii. The payment terms.

Because of the small size of the imports to the East African market, the importer will most probably like be charged the Platts plus a premium.

Table 4.1: Logistics Costs for Gas Oil and HFO as at May 2008 in US$ per metric tonne

		HFO	GASOIL
1.0	**MOP_Means of Platts**	**587.35**	**1,199.30**
2.0	**IOF (Insurance Ocean-Going Freight)**		
2.1	Freight	55.00	55.00
2.2	Marine Insurance (1.003*c&f*0.077%)	0.50	0.97
2.3	War Risk (1.003*c&f*0.0275)	0.18	0.35
2.4	**Total IOF**	**55.67**	**56.31**
3.0	**FLOC (Fuel Logistic Ongoing Costs)**		
3.1	KPA warfage (shore handling) (US$2.00/MT+16% VAT)	2.36	2.36
3.2	Ocean loss (0.5% CIFLW)	3.23	6.29
3.3	Clearing Port of Mombasa (Kshs 35,000/5000MT)	0.11	0.11
3.4	Handling charges (US$5/cubic meter)	5.36	5.92
3.5	Inspection charges (0.1638 KShs/MT)	0.00	0.00
3.6	Analysis charges inclusive of VAT	0.17	0.17
3.7	Northern Corridor Transit Levy	0.12	0.12
3.8	Customs bond (US$0.85/cubic meter)	0.91	1.01
3.9	Depot Throughput Charges - Mombasa	7.50	7.50
3.10	Road freight from Mombasa to Kampala (US$120/cubic meter)	128.91	142.18
3.11	Clearing Kenya-Uganda border (Shs 30,000 per truck)	0.54	0.60
3.12	Transit Loss	0.62	0.61
3.13	Insurance, goods in transit		
3.14	Premium (Oil company profit)	15.00	15.00
3.15	Bio-coding (UNBS)		2.08
3.16	**Total FLOC**	**164.83**	**183.94**
4.0	**Total Logistics Costs**	**220.51**	**240.26**
5.0	**FP_Final Price (Excl.VAT)**	**807.86**	**1,439.56**

Notes:

1 Transporters take the risk of losses during transportation
The allowable transit losses are:HFO 0.10% and AGO 0.10%

2 Railway transport to Kampala is US$108/cubic meter but the oil company takes the risk of loss
As result, the companies spent US$6/cubic meter on surveillance from Mombasa to Kampala

3 Freight charges for the Dar-salaam Kampala is etimated at US$220/MT

4 The customs bond is claimed back within a period of 12 months

5 Transport charges based on a 3-axle trucks is US$0.115/cubic meter/km while the rate for a 4-axle truck
is US$0.1/cubic meter/km & the distance from Mombasa to Kampala & Jinja are 1140 km & 1060 km respectively.

6 The costs would change if a pipeline is used up to eldoret or Kisumu. Pipeline costs are US$40/km.

7 Assumed density of HFO is 0.932 kg/cubic meter and for AGO is 0.845kg/cubic meter

8 Freight charges to the port of Mombasa range between US$49-60/MT

4.2 Ocean going/ freight charges

The importing company arranges the ocean freight usually through competitive tendering utilizing a ship broker. The ocean freight depends on the size of the shipment and the nature of the contract. If the shipping contract is long term, the ocean freight will be relatively lower. Therefore, large oil companies or a consortium is likely to negotiate a lower ocean going freight charges than a small oil company. Allowable marine losses are around 0.3% while marine insurance is also around 0.3%.

4.3 Transport Costs from Mombasa to Various Destinations in Uganda

Transport costs vary by the mode of transport and the route. As already highlighted, petroleum products from Mombasa can be transported by a pipeline to Nairobi, Kisumu, and Eldoret. As earlier indicated, HFO by its very nature cannot be transported by pipeline. It is therefore prudent to assume that HFO would be transported by road tankers. The railway would have been a cheaper means of transport, but the turn around is very low. It takes about 3 weeks to one month for the product to move from Mombasa to Kampala by rail compared to 6 to 7 days by road tankers. The turn around for a road tanker for each of the destinations is as shown in table 4.2 below.

Table 4.2: Turn-around for the Road Tankers for Various Destinations

	Delivery Period	Number of trips in a month
Mombasa - Kampala	15 days	2
Nairobi - Kampala	6-7 days	4
Nakuru - Kampala	6 days	4
Eldoret - Kampala	4-5 days	6

The detailed prices of the road transport as well as rail are as shown in annex 1 as at May 2008. Contracts between the fuel suppliers and transport companies have been generally of a long-term nature with the charges mostly fixed. Usually a flexibility clause is included in these contracts which provides for the renegotiation of the charges whenever the retail price of diesel in Kenya or retail prices increase by more than 5 – 6%. However, due to the recent persistent increases in oil prices, the transporters are asking for the renegotiation of the contracts to provide for more frequent adjustments in the transport costs. This change will have implications to the fuel supply contracts already entered into between the thermal generation companies and the oil companies. Fuel costs account for almost 43% of the total costs of transportation. The other costs are almost fixed and include $600 per truck per year for the transit goods license in Kenya and Ushs 300,000 per truck per year for calibrating each truck.

The transport charges as shown in appendix 3 are as quoted by the transport companies. However, the transport contracts differ depending on the volume of the product to be transported, duration of the contract and the track record of the oil company. Large oil companies such as Shell and Total (U) Ltd are likely to negotiate large discounts compared to small oil companies. It is for example the case that the transport charges for the Aggreko Kiira 50 MW plant has an inbuilt 11% discount on transport charges.

The Dar es Salaam to Mombasa and Kampala route is much more expensive in terms of costs and other logistical barriers. It is estimated that this route costs US$100/cubic meter higher than the Mombasa - Kampala route besides the turn around on this route being high.

Allowable losses on pipeline are about 0.1% which is similar to what is allowable on road transport. Storage losses for HFO are 0.10% while for AGO are around 0.15%. The insurance of goods in transit is the responsibility of the transporter.

4.4 Oil Companies Margin/Premium

Oil companies add a margin (premium) to the fuel cost in order to arrive at the price to be charged to the consumers and in this case generation companies. The oil company margin should be sufficient to recover their operating costs and investment costs plus a reasonable return on investment.

During the survey, it was difficult to get firm responses on the size of the company margin. All the oil companies covered in this study were unwilling to disclose the size of their margins. However, based on the various fuel supply contracts that we were able to access, the company’s margin ranges between US$10-20 per cubic metric tonne. Contrary to this, we also came across a contract where this margin was as high as US$64 per metric tonne. It is difficult to understand why such large variation exists but one possible explanation could be the nature of risks being transferred to the fuel supplier particularly the oil quality risk.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Main Conclusions

viii) The report shows that the demand for HFO and other oil products is projected to continue increasing for the years to come mainly due to the increased use of HFO in generation of electricity, increased economic activity and the associated increase in number of cars. The demand increase would suggest a need for a strategy to develop storage and transport facilities to accommodate the demand. Therefore, the use of HFO for thermal generation will depend on the availability of new facilities for storage and transportation.

ix) Transporters are confident that they can meet the logistics of the growing demand. However truck registration expenses and associated constraints, lack of tax incentives for investors in the sector continue to limit the growth and development of the sector. The rail transport, on the other hand, which is a cheaper means of transporting oil products is still highly inefficient. The EAC partners should reexamine the whole privatization process of the rail system and address the inefficiencies. Without functioning ferries the Tanzania route and the Rail – Kisumu route would not be an efficient supply route of oil products. It involves time loss as a result of delays in connecting the rail system with the ferry system for quick delivery.

x) Limited storage facility for LFO and HFO exists in the country. At least for LFO, storage capacity exists at the oil company depots in Kampala, Jinja and Mbale. Many of the small retailers do not have adequate storage capacity. Existing storage and transportation logistics for diesel is fully committed to meet current consumption levels. The limited HFO storage facilities are located at the customers site.

xi) While the transporters and the fuel suppliers could previously enter into long term contracts with fixed transport charges only renegotiated after the diesel pump prices have increased by 5-6%, the recent sharp increases in prices of petroleum products have forced the transporters to renegotiate these contracts with an intention of making transport charges a variable cost with well established adjustment formula. The same applies to freight charges. However, at the time of this study, the industry was still renegotiating these issues.

xii) It emerged that fuel suppliers as well as transporters are concerned that Uganda Electricity Transmission Company Limited (UETCL) does not guarantee generating companies a minimum off-take of their power. As a result, the generation companies are unwilling to guarantee a minimum fuel supply. Consequently, the fuel companies cannot guarantee a minimum turn-around for the road tankers. This raises an investment risk and as a result the companies are willing to recover their investment costs over a short period of time.

xiii) The study has established that the logistics costs vary by type of transport and route. The ocean going/freight cost are estimated at US$49-60/tonne as at May 2008. The actual cost paid depends on the size of the shipment and the tenor of the contract. The logistics costs from Mombasa to Kampala excluding the company margin by road tankers amounts to US$120/Cubic meter in the case of 4-axle road tanker and US$137/cubic meter in the case of 3-axle road tanker. The company margin/premium is in the range of US$10-20/cubic meter.

xiv) The proposed legislation on changing from four-axle to three-axle trucks in all East African countries is likely to raise the transport costs by almost 15%. This is another reason why transporters are demanding that the transport costs become a variable cost adjustable every quarter.

5.2 Major Policy and further study Implications

viii) Consideration should be given to use government storage tanks in Jinja, as the industry moves to develop their own storage capacity. Presently the three tanks are holding petrol, diesel and kerosene. The kerosene tank could be decommissioned to hold diesel as well specifically to serve thermal generation efforts as more storage facilities are being planned or erected.

ix) Existing road fuel tankers are fully committed to meet current demand. However, transport companies visited have shown that they have capacity to enhance their road tanker transport fleet. They however need support in terms of reducing the costs of truck registration and be given tax incentives as given to other investors in the sector.

x) To further enhance the transport sector, a review of the concessions in the railway system is needed urgently. Inspite of the privatization, government support in the areas of capital investments in locomotives and new wagons appear to be still desirable. Further to this, government contribution towards repair and investment in new ferry equipment on Lake Victoria is very crucial.

xi) There should be Government-to-Government discussions and agreements to minimize the non-tariff barriers such as impediments imposed by KRA policy on transit products within Kenya, constraints to being a KPC member for smaller companies and port handling services. The MEMD should urgently take action and organize bilateral discussions on key constraints highlighted in the report.

xii) Efforts to construct the pipeline from Eldoret to Kampala should be speeded up.

xiii) The generation companies should be allowed to enter into fuel supply contracts with oil companies which provide for quarterly adjustment of ocean freight and inland transport costs. The ERA, however, should ensure that the thermal generation companies seek approval of the fuel supply contracts from ERA before they are signed. In view of the fact that fuel related costs are a pass-through cost, the fuel supply contracts should be public documents and the consumers should be accorded an opportunity to provide comments on these contracts in a manners similar to power purchase agreements (PPA's).

xiv) Government should provide sufficient time before outlawing the 4-axle road tankers.

REFERENCES

Nexant (2001), Kenya-Uganda Oil Pipeline Extension: Complimentary Study. A Final Report.

PDC (2005), Advisory Services for the Implementation of a New Regulatory Framework for downstream Petroleum. A Final Report

PPA (2006), Assessment of short term Generation Capacity Requirements in Uganda. A Final Report.

Appendix 1: Lists of Respondents

Name	Company
Mr. Tindimwebwa G	Rift Valley Railways
Mr. Francis Mutwangao	Total (U) Ltd
Mr. Ivan W. Kyayonka	Shell (U) Ltd
Mr. Mabweijano George	Shell (U) Ltd
Mr. Sam Patel	Multiple Hauliers
Mr. Charles Muhumuza	Electromax
Mr. Nils Arne Nessioy and Mr.Sverre Throndsen .	Jacobsen
Mr. Kaggwa and Mr. Sharr Ragesh	Uganda Tranporters Agencies

Appendix 2: Composition of the Study Team

Name	Institution
Dr. Patrick B. Birungi	PDC (U) Ltd
Mr. Benon Mutambi	ERA
Mr. Gerald Banaga-Baingi	MEMD
Mr. Charles Baker	ERA
Mr. James-Philip Sembeguya	ERA

APPENDIX 3:TRANSPORT CHARGES BY TYPE OF PRODUCT AS AT MAY 2008

A: Transport Charges for Gas Oil

Destination	Distance (km)	Ushs/cubic metre/km (4-axle)	Ushs/cubic metre/km (3-axle)	US$/cubic metre (4-axle)	US$/cubic metre (4-axle)
Nairobi to:					
Mbale	551	198.33	228.4	67.12	77.29
Tororo	551	198.33	228.4	67.12	77.29
Kampala	653	198.33	228.4	79.54	91.60
Entebbe	695	198.33	228.4	84.66	97.49
Magamaga	558	198.33	228.4	67.97	78.27
Jinja	573	198.33	228.4	69.80	80.38
Kisumu to:					
Tororo	151	252.7	290.6	23.43	26.95
Mbale	206	252.7	290.6	31.97	36.77
Magamaga	213	252.7	290.6	33.06	38.02
Jinja	228	252.7	290.6	35.39	40.69
Kampala	308	234.5	268.3	44.36	50.75
Entebbe	317	234.5	268.3	45.65	52.23
Eldoret to:					
Mbale	211	255.9	293.6	33.16	38.05
Magamaga	270	255.9	293.6	42.43	48.69
Kampala	350	255.9	293.6	55.01	63.11
Jinja	392	255.9	293.6	61.61	70.68
Nakuru to:				0.00	0.00
Mbale	394	222.6	255.9	53.86	61.92
Kampala	496	222.6	255.9	67.81	77.95
Entebbe	538	191.9	220.7	63.41	72.92
Mombasa to:					
Kampala	1140	171.6	195.8	120.14	137.09
Jinja	1060	185.6	213.3	120.83	138.86

B: Transport Charges for Fuel Oil

Destination	Distance (km)	US$/cubic metre/km (4-axle)	US$/cubic metre/km (3-axle)	US$/cubic metre (4-axle)	US$/cubic metre (3-axle)
Mombasa to:					
Jinja	1060	0.09	0.10	92.22	106.00
Kampala	1140	0.10	0.12	114.00	131.10
Hima	1585	0.11	0.13	181.96	209.22
Tororo	990	0.10	0.12	99.00	113.85
Magamaga	1045	0.09	0.10	90.92	104.50
Mbale	1038	0.09	0.10	90.31	103.80

C: Rail Charges

Destination	Distance (km)	US$/Tonne
Mombasa to Kampala:	1140	
AGO		108.2
Drums		108.2

Memorandum Items:

Exchange rate was Ushs 1628.24/US$ as at end May 2008 1628.24