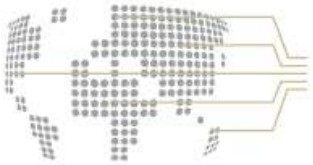

M§M
MAASTRICHT SCHOOL OF MANAGEMENT

DBA Assignment

Value Chain Analysis

Evans Makini Osano

"Conduct a value chain analysis for the sector of your research. In addition to the generic "types" of stakeholders, add a list of organizations that will be your target for surveying or interviewing. Provide data sources for completing the list of organizations. In addition to your diagram provide accompanying text that enables the reader to see how the various actors are linked to one another."

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15 September 2008

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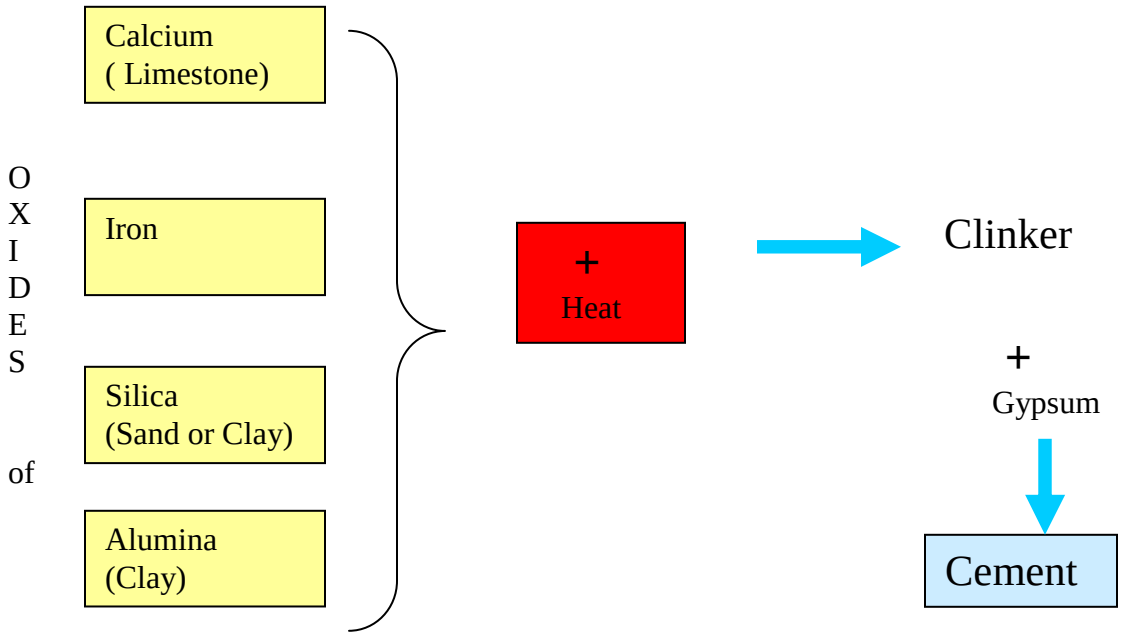
Introduction

The Cement and Electricity sub sectors contribute significantly to the manufacturing sector's productivity as well as employment generation in Kenya. The Electricity sector is the main source of energy used in manufacturing whilst the cement industry is a key indicator of economic performance. The two sub-sectors are also intricately linked in that electricity accounts for a significant percentage of the cement production costs.

Cement Sector

Cement is a binder, a substance that sets and hardens independently, binding material together. There are two types of cement: hydraulic, which hardens when water is added and non-hydraulic. The most common type of hydraulic cement is Portland cement, which has four chemical elements: calcium, silicon, aluminum and iron. Calcium is found in limestone and is usually mined in the vicinity of the cement factories, which extracted and crushed to gravel and is mixed with clay and sand. These materials are ground and heated in a kiln to high temperatures to form clinker. Clinker is added to gypsum and ground/milled to produce cement. A variety of fuels are used to heat the kiln including fossil fuel, coal, biomass and waste materials.

Figure 1: Portland Cement Manufacturing

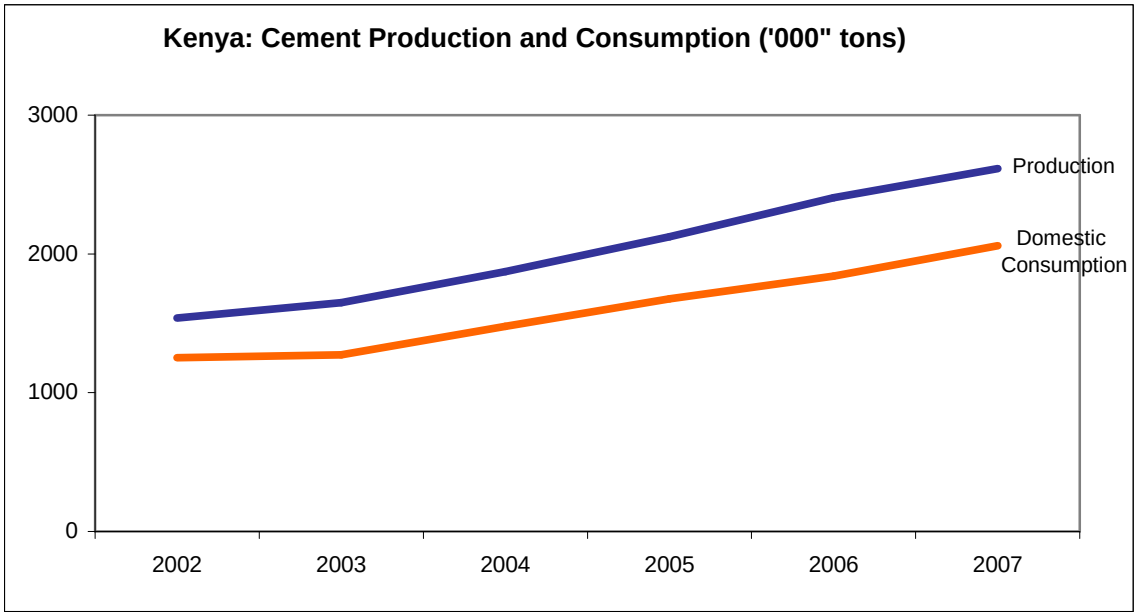


The global production of cement was estimated at 2.5 billion tons with China accounting for 44% of the world's total output in 2006. Africa accounted for 4% of the production, of which Egypt produced 36% of Africa's total. A group of multinational companies including Holcim, Lafarge and Cemex dominated the global cement value chain accounting for over 18% of global production in 2006. About 150 countries produced either cement or clinker. International trade in cement is relatively low due to its bulky

nature, which makes it expensive to transport. Consequently, less than 10% of the production is traded in international markets (Steinweg T, 2008).

In Kenya, there were four cement plants in 2007 with a combined production capacity of 3.03 million metric tons per annum. Bamburi Cement was the dominant player with 59% local market share in 2007 while East Africa Portland Cement (EAPC) and Athi River Mining (ARM) commanded 30% and 11% market shares respectively.

Figure 2: Kenya - Cement Production and Domestic Consumption 2002-2007



Source: Economic Survey (2008)

In 2007, cement consumption in Kenya stood at 2.1 million tons, translating to per capita consumption of only 58 kilos. This is low by international standards, as depicted in table 1 below:

Table 1: Per Capita Consumption of Cement

Country	Per capita Consumption (Kgs)
Kenya	58.3[1]
Egypt	405
Kuwait	1,224
Qatar	3,358
Turkey	4,030

Source: USAID, Economic Survey Kenya

East African Portland Cement Company (EAPC) had its production plant in Athi River, near Nairobi whilst Bamburi Cement had cement and grinding plants in Mombasa and an

[1] Consumption in Kenya is for 2007 and 2006 for the other countries.

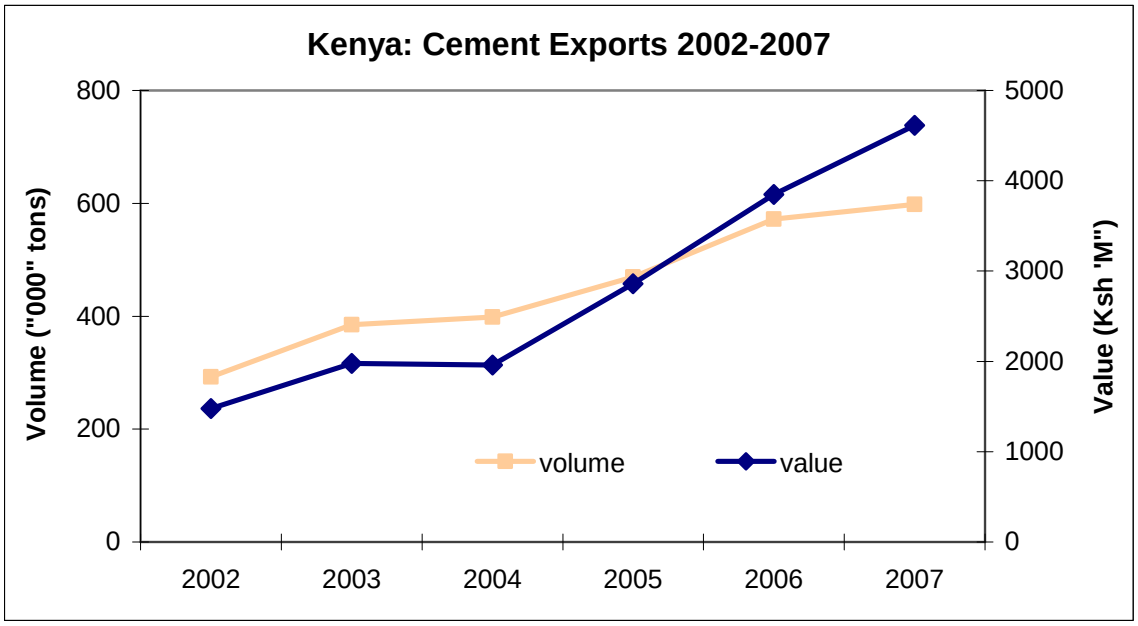
additional grinding plant at Athi River. Athi River Mining (ARM) plant was located near Mombasa in the coast region, which presented transport cost-disadvantages against its main competitors. At the present, ARM had to transport limestone, a key raw material mined around Athi River, to its plant at the coast for grinding and then transport the finished product back to Nairobi, more than 500 kilometres away, where most of the customers are located. To manage these costs, ARM was planning to build a grinding plant at Athi River.

The Cement industry was highly concentrated with Bamburi Cement's parent company, Lafarge, owning 54% in EAPC and 15% in ARM. However, Bamburi had not managed to gain effective control in the two firms, whose behaviour, perhaps besides price-setting appeared competitive and/or antagonistic. At least three players, Mombasa Cement, Catic Cement and Tororo Cement were expected to enter the scene whilst the existing players were planning capacity expansion, setting the stage for increased competition in the sector. The East African Cement Association (the industry lobby group) estimated that the surplus in the industry would rise from 0.2 million tons in 2008 to 2.4 million tons by 2012.

ARM was for instance, planning to increase capacity to 750,000 tons from 300,000 tons over the period. EAPC had invested in a new closed circuit mill to increase capacity from 720,000 tons to 1.3 million tons by the end of 2008 and reduce the cost of production. Bamburi Cement had also begun exploration work at Kanziko, Kitui for a new clinker plant (Bamburi Cement, 2008). In addition to increased capacity, a duty reduction in Kenya in 2008 from 40% to 25% was likely to see increased competition from imported cement

Growth in the sector was strong in the five years to 2007 supported by the resurgence in the building and construction sectors both locally and in the regional market. In the five years, production rose by 70% and was up by 8.7% in 2007. Exports of cement increased even more quickly over the five fours, Figure 4. During this period, export volumes rose by 105% while earnings were up by 212% from Ksh.1.5 billion in 2002 to Ksh.4.6 billion in 2007. In 2007, 23% of cement produced was exported.

Figure 3: Kenya: Cement Exports 2002-2007



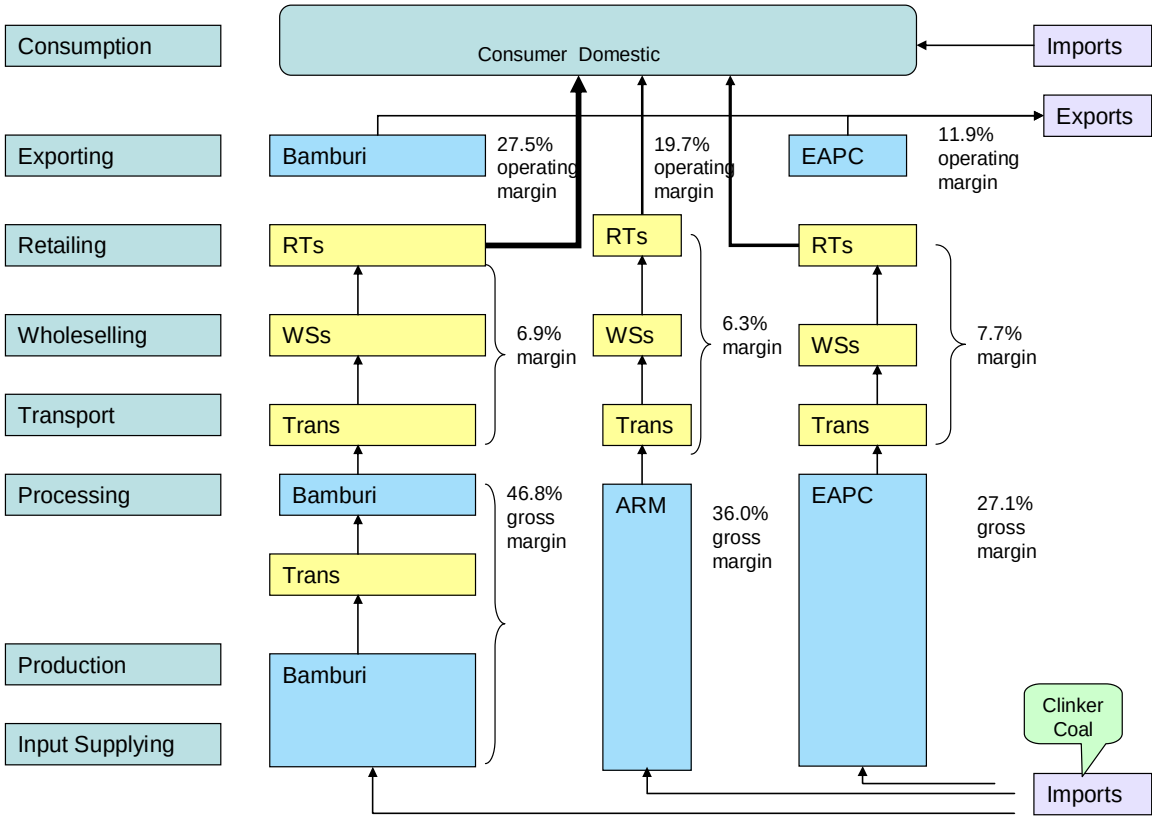
Source: Economic Survey (2008)

Cement production consumed a lot of energy, which constituted the bulk of the production cost. Energy accounted for up to 45% of the variable cement production costs (EAPC, 2006 and 2007). Consequently, production efficiency measures being undertaken by the various cement firms were aimed at addressing the cost of energy and in particular sought to substitute electricity and fossil oil. For instance, EAPC was planning to invest in a coal milling facility (coal grinding and dosing) to enable it cut back on oil and electricity in order to reduce energy costs from 45% to 30% of total production costs (EAPC, 2007).

Bamburi Cement was also focused on offsetting the high fuel and power prices with the use of alternative fuels such as cashew nuts and rice husks, which enabled it to achieve 28% alternative fuels substitution in 2007 (Bamburi Cement, 2008). In 2007, the company also implemented a Bio fuel project on mining reserve land by planting trees on a long-term basis, for fuel-wood to be used in kilns as a substitute of fossil fuel. It was not only the cost of electricity that was a concern to cement firms, but also its availability and reliability. For instance, Hima Cement, a subsdiary of Bamburi Cement operating in Uganda had to commission Ksh.110 million (US$1.7 million) generator to provide alternative supply during outages (Bamburi Cement, 2007).

Cement Value Chain

Figure 4: Cement Value Chain



Source: Author

Notes on the Value Chain

1. At the input levels, imports are mainly clinker but also coal and fuel oil.

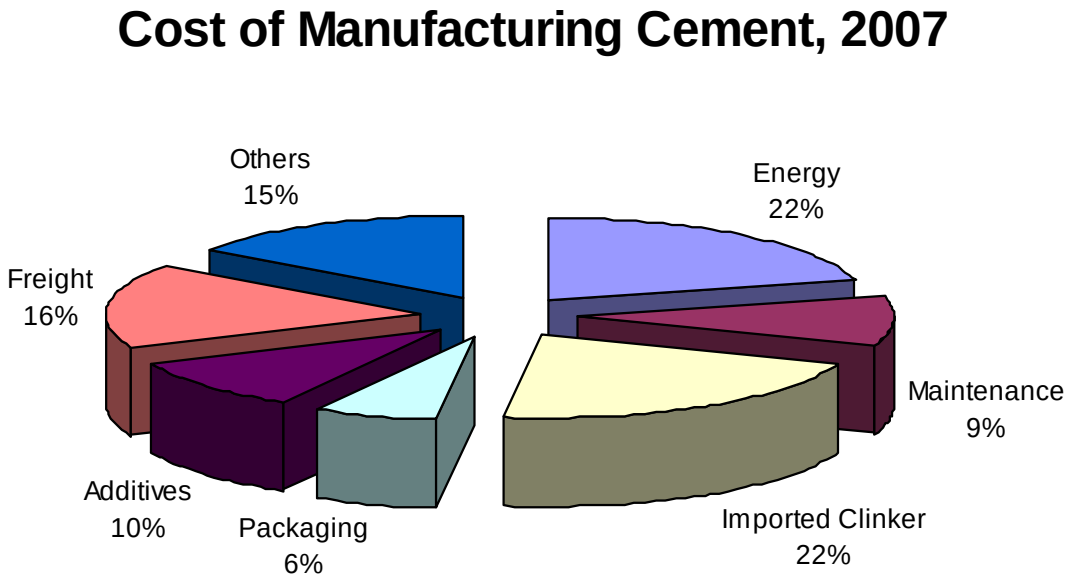
2. Exports are mostly to the regional markets. For instance in 2007, exports to Uganda and Tanzania stood at 514,000 tons and accounted for 86% of all cement exports from Kenya.

3. Bamburi Cement has a clinker plant in Mombasa and grinding plants in Mombasa and Athi River, near Nairobi. Transport after production is for clinker to the grinding plant in Athi River.

4. Athi River Mining (ARM) has grinding plant and production facility at Mombasa but sources some of its raw materials from Athi River near Nairobi.

5. East African Portland Cement (EAPC) has both its clinker and grinding plants at Athi River, near Nairobi. However, it imports some of its clinker requirements.

Figure 5: Cost of Manufactured Goods



Source: Bamburi Cement, 2008

Gaps on the Value Chain

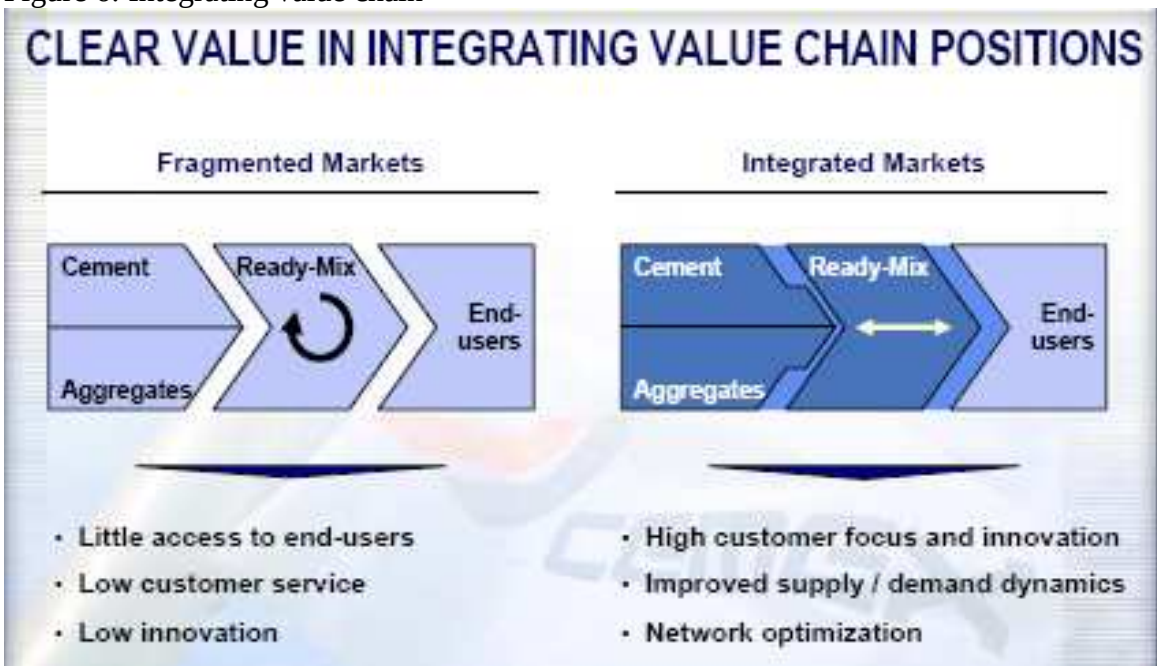
Bamburi Cement is the most efficient producer of cement with gross margins of 47% whilst East African Portland is the least efficient, gross margins only stand at 27%. It also has the highest distribution costs (which include transport) at 7.7% of sales compared to the other two cement plants at 6.2%. Transport alone, takes 5.5% of sales for East African Portland cement despite having the best advantage location-wise. Its clinker and grinding plants are located at the same area at Athi River, near Nairobi. This is also close to most of its customer base.

Bamburi's cost advantage, arise in part from its economies of scale (it has by far the largest installed capacity), relatively efficient plant and innovativeness in the use of energy. For instance, between 2007 and 2006, it reduced its cost of energy by over 11%, despite 14% increase in production.

The gaps in the value chain are mainly at the production and processing level. This is the activity with the highest margins. Further, cement demand is rising rapidly in the region, which coupled with low per capita consumption (58 kilos) provides a strong long-term opportunity.

There are opportunities in integrating the value chain by entering the aggregates market (sand, gravel, stone, recycled aggregates) to provide the customers with enhanced solution to building needs. Opportunities also exist for ready-mix concrete and other concrete products as well as investment in mixer trucks for large scale construction projects.

Figure 6: Integrating value chain

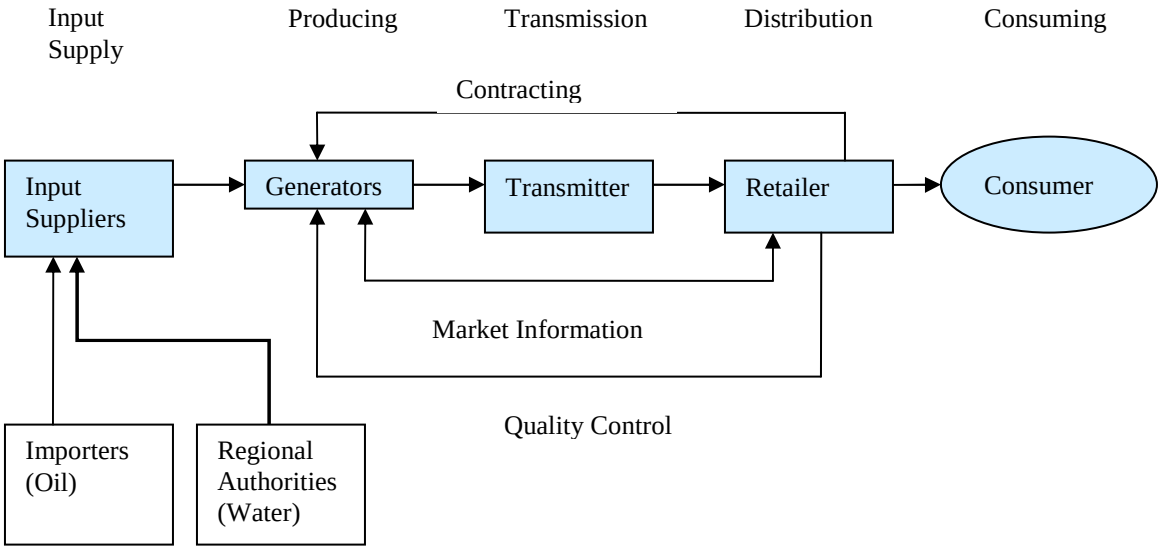


Source: Cemex, 2008

Electricity Generation & Distribution

Kenya had an installed power generation capacity of 1,263 MW in 2008 against peak demand of 1,050MW. This translated to a reserve margin of only 6% against international benchmark of 15% for similar sized systems (Electricity Regulatory Commission, 2008). The installed capacity was dominated by Hydro, with 56% of capacity. Installed capacity was stagnant over the last five years to 2007 as little new capacity came on-stream. In addition, growth in supply failed to keep pace with demand. By 2008, installed capacity was barely meeting national peak demand (KenGen, 2008) implying that power rationing was imminent. Access to electricity services, especially in rural areas, was extremely limited with only 4% of the rural population connected to electricity supply. On the other hand, electricity tariffs were relatively high by international standards, but barely sufficient to meet operating costs (IMF, 2008).

Figure 7: Electricity Value Chain Map



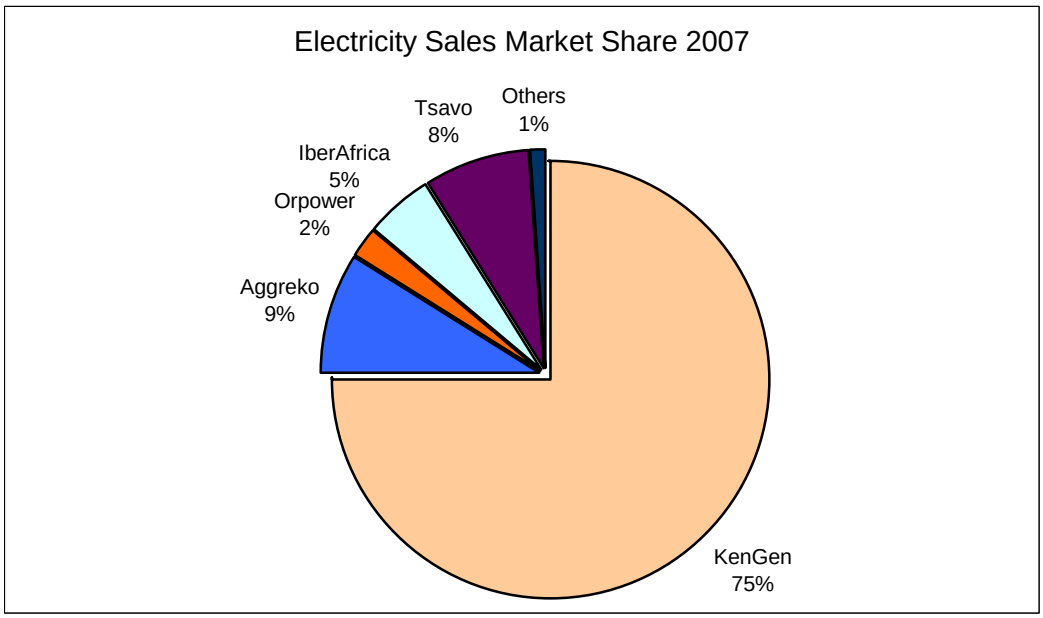
Governance

The sector was regulated by the Energy Regulatory Commission (ERC), which had the responsibility for economic and technical regulation of power, renewable energy and down stream petroleum sub-sectors. This mandate included tariff setting and review, licensing, enforcement of standards, dispute settlement and approval of power purchase and network service contracts.

Generation

Kenya Electricity Generating Company (KenGen) was the leading power generation company in Kenya, producing 75% of electricity in Kenya. KenGen was listed at the Nairobi Stock Exchange, but majority owned by the Government of Kenya. It had 1,500 employees. There were four Independent Power Producers (IPPs), which generated electricity through thermal Oil. Only one IPP, Orpower, was in the geothermal sector, but with a relatively small installed capacity. There had been little effort to promote renewable power sources such as solar and wind energy as well as small hydro-plants.

Figure 8: Kenya Electricity Sales Market Share 2007



Source: KenGen, 2008

Transmission and Distribution

Power was transmitted and distributed through a monopoly, Kenya Power & Lighting (KPLC), which was also listed at the Nairobi Stock Exchange. The Government of Kenya held a 40% majority control in the company. At the end of the 2007 financial year, KPLC had 6,400 employees and over 900,000 customers. However, the customers were concentrated with 500 large commercial and industrial customers accounting for 36% of revenues. Similarly, the capital city, Nairobi accounted for over 54% of sales. KPLC had experienced high systems and technical losses in the past 6 years, which stood at 17.9% of all energy purchased in 2007. During the year, 1,060 GWh of power was lost due to power losses as illustrated in Figure 8 below. Improving operational performance and reducing the systems losses were therefore major focus areas for management in the past few years.

Recent reform initiatives in the sector sought to further un-bundle the power sector in Kenya by transforming the power transmission network into an open access system to

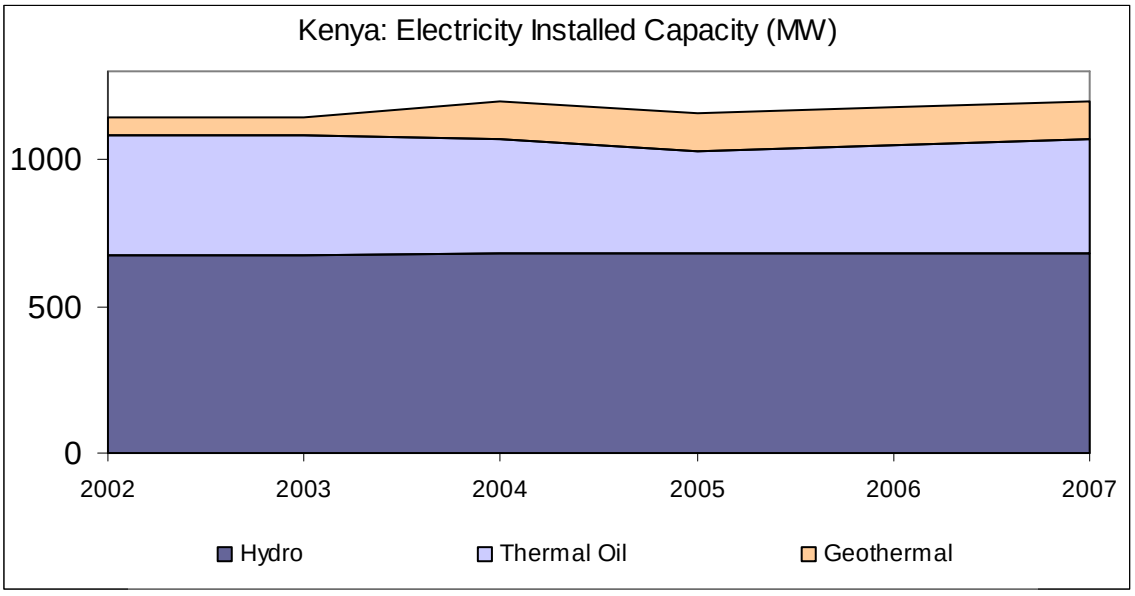
allow large electricity customers to purchase power from generators. This was expected to inject more competition in the sector implying that current operators urgently needed to improve performance to remain competitive. In this regard, KenGen initiated a performance improvement initiative dubbed "Good to Great" probably inspired by Collins (2001) book by the same title. The firm also announced US$1 billion capital raising initiative to increase generation capacity over the next few years. KPLC, on the hand had placed more emphasis on operational performance improvement and to double the number of customer connections from the current 1 million to 2 million in the next five years.

Challenges in the Sector

The unreliability of hydropower as a source of electricity was well documented mainly caused by changes in weather patterns. In particular, there was a severe power shortage and consequently biting rationing in 2001, following a drought. In a bid to meet this generation shortfall, thermal oil emergency power producers were introduced, but at tariffs which were often higher than what consumers paid for the electricity. What was supposed to be a short-term measure following the severe power rationing in 2001 become a permanent feature of installed capacity as illustrated by Figure 5.

In 2007, Thermal Oil generation accounted for 32.5% of installed capacity, only a slight decrease from 35.7% in 2002, at the peak of last major power shortage in Kenya. For instance of the 200MW two-year planned capacity expansion ending in 2009, 140MW or 70% was to be thermal further adversely impacting on the generation mix.

Figure 9: Kenya – Electricity Installed Capacity

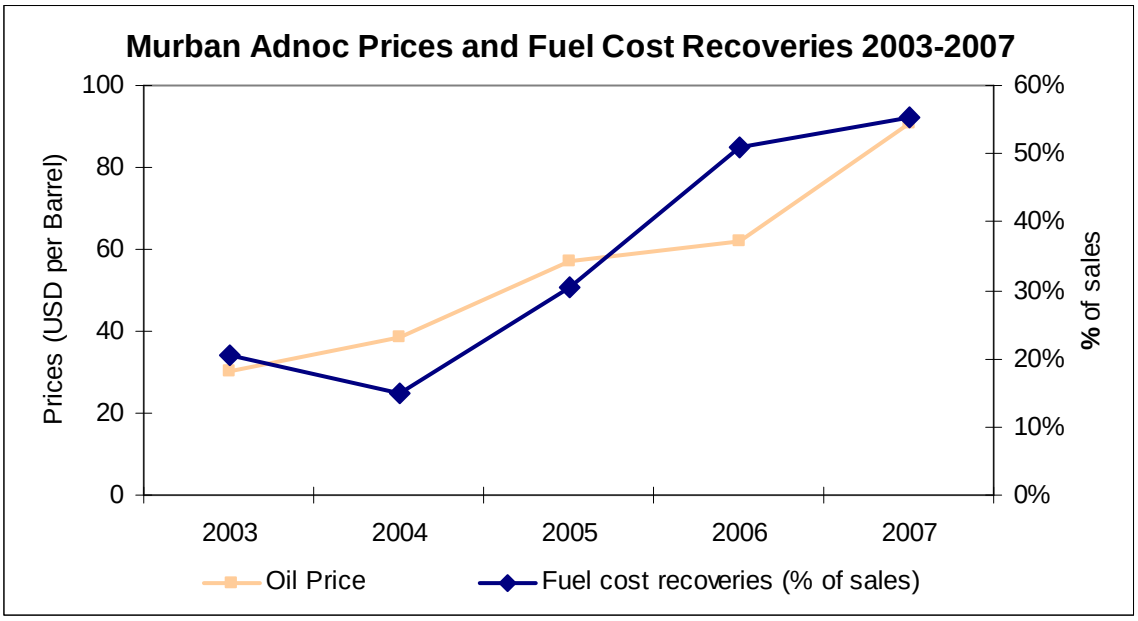


Source: Economic Survey (2008)

The over reliance on thermal oil generation presented a major concern, with rising international crude oil prices. Fuel costs adjustments were typically wholly passed on to

the consumers thereby increasing tariffs. For instance, in 2007, fuel cost adjustment accounted for over 55% of the cost of consumption. This is illustrated by Figure 6 below[2]. With international oil prices rising to over US$140 a barrel in 2008, this was likely to exert significant pressures on electricity costs and overall production costs for manufacturers.

Figure 10: International Oil Prices and Electricity Fuel Cost Recoveries



Source: Economic Survey (2008) and KPLC Annual Reports (various)

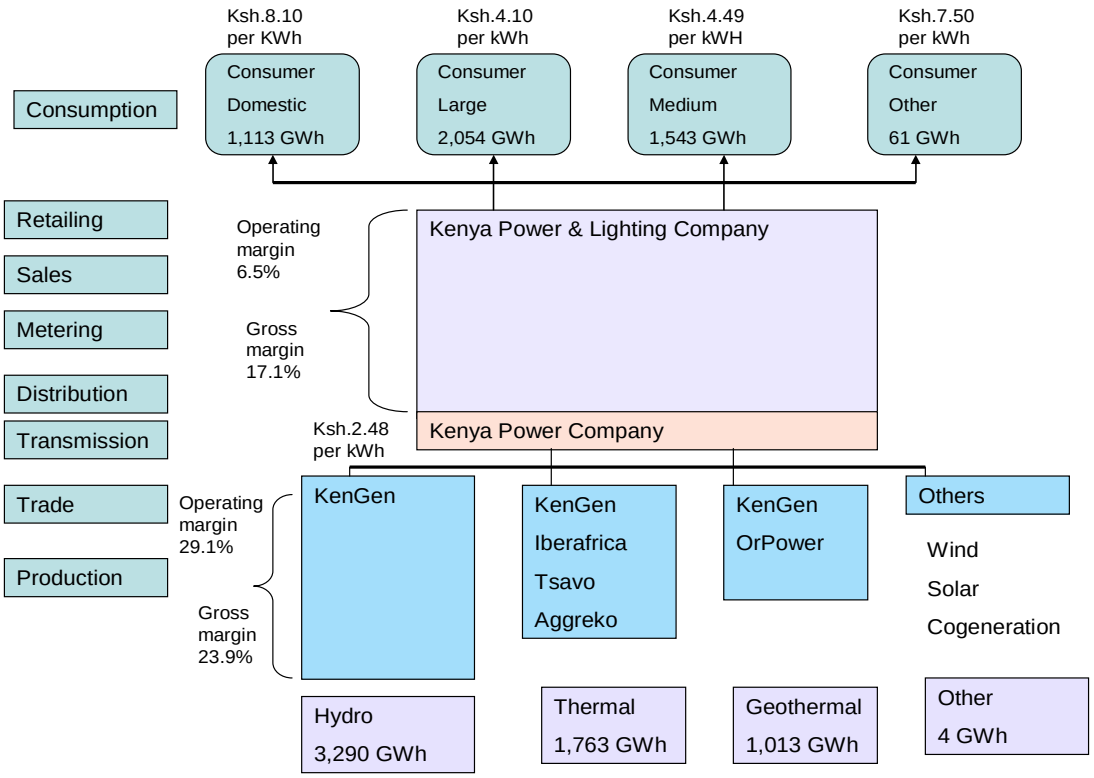
However, Soaring oil prices and higher electricity tariffs[3] were also likely to force Kenyans to explore alternative sources of energy. For instance, increased interest in co-generation had been noted with a sugar-miller, Mumias Sugar as a new entrant with capacity of 34MW, of which 25MW was to be released to the national grid by January 2009. Solar photovoltaic (PV) was also likely to gain importance in the provision of off-grid rural and urban slum areas electricity for low power applications. About 4MW of Solar PV power was installed in Kenya in 2008 (Ongwae E, 2008).

[2] The reference international prices are for Murban crude oil in US$/per barrel. The price is Abu Dhabi Free on Board. Kenya imported the bulk of her oil requirements from Abu Dhabi.

[3] In June 2008, Kenya's Electricity Regulatory Commission increased tariffs by over 24% before taxes in order to encourage investment in new power generation, transmission and distribution in a more sustainable manner.

The Electricity Value Chain

Figure 11: Kenya Electricity Value Chain



Source: Author

Notes on the Value Chain

1. KenGen accounts for 75% of electricity generation and is paid a blended tariff of Ksh.2.48 per kWh, for the different sources of power hydro, thermal and geothermal, with effect from July 2008.

2. Operating margin is higher than gross margin because of significant interest income on KenGen's liquid investments. In addition, Kenya Power & lighting Company's margin's are negatively impacted by large systems losses, estimated at nearly 18%.

Tariffs

The tariffs are based on long run marginal cost (LRMC) method to yield fully cost reflective tariffs.

Tariffs are set at two levels

i) Retail – This is what the final consumer pays
ii) Bulk – This is what the transmission/distribution company pays the generators

Retail Tariffs

Customers are segmented into five main consumer categories:

i) Domestic Consumers (DC)
ii) The Small Commercial (SC)
iii) The Commercial/Industrial (CI)
iv) The Interruptible (IT)
v) The Street Lighting (SL)

The DC is applicable to domestic consumers metered at 240V or 415 V and whose energy consumption does not exceed 15,000kWh per month. The Small Commercial are metered at 240V or 415V with monthly energy consumption which does not exceed 15,000kWh.

The Commercial/Industrial (CI) category is subdivided into five sub-categories – CI1, CI2, CI3, CI4 and CI5 all metered at different voltages. CI1 are metered at 415V three phase with monthly energy consumption in excess of 15,000kWh. CI2, CI3, CI4 and CI% are metered at 11kV, 33/40kV, 66kV and 132kV respectively with no limitation on energy consumption.

Interruptive Consumers (IT) off-peak are metered at 240V or 415V and with consumption not exceeding 15,000kWh and the Street Lighting are metered at 240V.

The charges effective July 2008 are as follows:

Table 2: Electricity, Retail Tariff July 2008

	Fixed Charge Ksh (Per Month)	Energy Charge Ksh per kWh per month	Demand Charge Ksh per kVA per month
Domestic	120	i) 2.00 : 0-50 units ii) 8.10: 51-1,500 units iii) 18.57 units above 1,500 units	
Small Commercial (SC)	120	8.96	
Commercial (CI1)	800	5.75	600
Commercial (CI2)	2,500	4.73	400
Commercial (CI3)	2,900	4.49	200
Commercial (CI4)	4,200	4.25	170
Commercial (CI5)	11,000	4.10	170
Interruptive (IT)	120	4.85	600
Street Lighting	120	7.50	

Data Source: ERC, 2008

The retail tariffs are approved by the Electricity Regulatory Commission (ERC). The last such review was undertaken in July 2008, for a three-year period. Retail tariffs follow the utility's (Kenya Power and Lighting) marginal cost structure.

The retail tariff has four components:

i) Energy charge[4]
ii) Fixed charge[5]
iii) Demand charge
iv) Fuel Cost charge[6]

Bulk Tariff

ERC's policy on revenue requirements is based on:

i) Market return on prudent investment[7]
ii) Depreciation
iii) Prudent levels of operation and maintenance expenses
iv) Allowances for quality of service standards
v) Taxes

Another key revenue consideration is systems losses by Kenya Power & Lighting Company. This was initially capped at 15%. However, effective July 2008, ERC agreed to adopt an agreed target power system losses at the base year subject to a yearly continuous reduction at the rate of 0.5% per annum up to 2011. Consequently, system losses were expected to decline from 16.9%in 2007/8 to 15.4% in 2010/11.

Power Purchase Agreements are not set by the regulator ERC, as they subject to competitive procurement process. However, with respect to KenGen, there is no competitive bidding and tariffs are negotiated with Kenya Power & Lighting Company (KPLC) but approved by ERC because of consumer protection reasons. The last such review was approved by ERC effective July 2008. However, the tariff revision has now been contested by KenGen and is subject to a dispute resolution mechanism.

The bulk power tariffs are set for each individual plant and have 3 components:

a) Capacity payment

[4] These are based on LRMC adjusted for the financial requirements of KPLC.
[5] This is set to cover customer-related cost of metering, meter reading, inspection, maintenance, billing and customer accounting.
[6] This depends on the generation mix and covers cost of generating power through fossil oil and the exchange rate movements.
[7] Based on i) "regulatory Asset Base" which is Gross Fixed Assets (excluding work in progress) less Accumulated Depreciation + Working Capital and ii) Rate of return on Regulatory Asset base, which is based on the Weighted Average Cost of Capital (WACC).

i) Availability Payment Component – to recover all capital related costs (repayment of foreign and local loans, return on equity, taxes and duties) based on target availability and contracted capacity of the plant.[8]

ii) Fixed O&M Payment Component – to recover all fixed operation and maintenance cost based on the target availability and contracted capacity. This is also adjusted with respect to local inflation.

b) Energy Payment

i) Variable O&M Payment Component – to recover all variable operation and maintenance cost (with exception to fuel cost) based on the energy delivered by the plant.

ii) Fuel Payment Component – to recover all fuel related cost including consumption, procurement, transportation and delivery of fuel to the plant in case of thermal plants. In case of geothermal plants the fuel cost will compromise the cost of the delivery of steam to the plant. The fuel component is based on the plant specific guaranteed fuel consumption and fuel prices.

c) Other Supplemental Payment

These may be made to recover additional costs for start-ups and shut-downs of plants.

Transmission Tariff

Kenya was considering further unbundling the power sector by transforming the power transmission network into an open access system to allow large electricity customers to purchase power from generators.

This would call for setting of transmission tariffs, which were likely to include network charges, connection and market operation charges.

Gaps in the Value Chain

Electricity transmission and distribution is undertaken by a monopoly: Kenya Power Company and Kenya Power & Lighting Company respectively. However, there are plans to unbundle transmission and distribution, which should provide opportunities for generation companies to serve end-consumers and improve margins. This may also address system losses.

[8] It may include incentives with respect to deviations from plant availability and capacity from agreed targets and time-differentiation with respect to load periods or seasons.

The gaps in the electricity value chain are mainly in two fronts:

1. Generation
2. Parallel systems, off the grid: This includes solar energy, wind and co-generation.

In addition, Kenya Power & lighting Company has an opportunity to increase operating margins by:

i) Selling more power and therefore achieving economies of scale
ii) Reducing systems losses
iii) Increasing consumer tariff's – however, this is difficult given regulatory constraints.

Kenya had an installed power generation capacity of 1,263 MW in 2008 against peak demand of 1,050MW. This translated to a reserve margin of only 6% against international benchmark of 15% for similar sized systems (Electricity Regulatory Commission, 2008). There is therefore significant room to increase generation capacity if demand projections are to be met. Within generation there is also room to change the mix in favour of geothermal. This is mainly because of two factors: Low-cost hydro sources have already been exploited and due to unreliability of weather, destruction of water catchment areas, this source shall continue to be unreliable.

In addition, thermal sources although important for filling short-term capacity shortfall are not sustainable long-term due to high costs, particularly on oil prices. However, geothermal potential is underutilized at the Rift Valley. Although the potential is estimated at over 3000MW, less than 10% is exploited. The Kenya Government has established a geothermal development company that would be involved in exploration, and therefore cover most of the exploration risks and enable investors to participate in generation once commercial viability has been established.

There are also significant opportunities for providing off-grid solutions through the development of micro and small hydro stations, wind mills and solar energy solutions. The government has started promoting these alternative sources of power. For instance, in the 2008/9 budget the government set aside Ksh.300 million (US$4.6 million) for the installation of solar power in education institutions throughout the country. This support is expected to continue in upcoming budgets. In addition, high power costs are also likely to encourage domestic consumers to switch to cheaper alternatives, including the use of solar for heating. Further, given the low connectivity to the grid throughout the country, off-grid solutions would remain viable for a long time to come.

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