

Assessment Of Liquefied Petroleum Gas (LPG) Utilisation In Ghana - A Study At Tarkwa

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ABSTRACT: Liquefied Petroleum Gas (LPG) is one of the most common and an alternative fuels used in the world today. In Ghana, Liquefied Petroleum Gas (LPG) is increasingly gaining popularity as a preferred fuel for industrial, commercial and domestic purposes as a result of its efficiency, affordability and many more. This study aimed at assessing Liquefied Petroleum Gas utilisation in Ghana using Tarkwa as a test case. It adopted survey as its research design and complemented with literature review. The major instruments for data collection were questionnaires and personal interviews. The questionnaires were administered to 320 inhabitants of Tarkwa. Data collected were analysed using statistical methods. The study revealed the key players in the distribution of LPG in Ghana as Bulk Distributing Companies (BDCs), Oil Marketing Companies (OMCs), Liquefied Petroleum Gas Marketing Companies (LPGMCs), Bulk Oil Consumers (BOCs) and consumers. It also exposed the causes of sporadic shortages of LPG as mainly due to higher demand on the product and technical disruption such as pumping, berthing, storage and delivery constraints. Government should secure private sector participation to supplement the midstream refining sector to avoid further shortages which cause inconveniences to the consumers and others. Key players in the supply chain should be made aware of their responsibilities in order to take the needed initiatives that will result in positive impacts on the supply chain.

Index Terms: biomass, Liquefied Petroleum Gas (LPG), oil, supply chain, wood fuel

1. INTRODUCTION

Crude oil is the unrefined state of oil which is produced from a reservoir and mainly consists of hydrogen and carbon. It can be refined to get so many products which can be used for different purposes. Some of the end products that can be processed from the crude oil are diesel, gasoline, bitumen, lubricating oil, liquefied petroleum gas, and many others. Liquefied Petroleum Gas (LPG) is one of the most common and an alternative fuels used in the world today (Anon, 2013). In Ghana, Liquefied Petroleum Gas (LPG) is increasingly gaining popularity as a preferred fuel for industrial, commercial and domestic purposes. This could be attributed to its reliability, efficiency, and portability. LPG also burns clean without producing smoke and with low pollutant emissions. These inherently clean characteristics are especially important to reduce indoor air pollution and therefore, LPG is a major contribution to the better health and sanitation as compared to traditional wood fuel such as fire wood and charcoal, which are the major sources of fuel used in Ghana contributing about 73.9% households cooking fuel (Anon, 2004; Anon, 2012). The consumers of Liquefied Petroleum Gas in Ghana have over the past years experienced sporadic shortages of LPG. These shortages affect business such as food vendors, welders, motorist and many others. LPG shortage reduces productivity, creates anxiety and inconveniences as users may have to adopt traditional fuels which are not very effective compare to LPG. This research seeks to assess LPG utilisation in Ghana using Tarkwa as a test case. It will reveal among others the major users of LPG, key players of LPG distribution in Ghana, causes of LPG sporadic shortages and many more.

2. LOCATION AND SIZE OF THE STUDY AREA

Tarkwa, the capital of the Tarkwa-Nsuaem municipality of the Republic of Ghana is a town in the south-western part of Ghana. Tarkwa is a town which is blessed with gold and manganese and therefore has lots of mining companies like Goldfields Ghana Limited (GGL), Anglo-gold Ashanti (AGA) and Ghana Manganese Company (GMC). The inhabitants are mainly into mining of these minerals and agriculture. The municipality is situated between latitudes 4° 0' 0"N and 5° 40' 0"N and longitudes 1° 45' 0"W and 2° 1' 0"W (Figure 1). It is bounded to the north by Wassa Amenfi District, the south by the Ahanta West District, the west by the Nzema East District and the east by Mpohor Wassa East District. The Tarkwa-Nsuaem Municipality is estimated to have a total land area of 2354 km². Most of the habitants of Tarkwa are migrants from other parts of the country (Akabzaa and Darimani, 2001).



Figure 1 Map showing the Location of Tarkwa

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3. THE GHANA LPG PROMOTION PROGRAMME

The Ghana LPG promotion programme started in 1990 with short and long term aims of eliminating flaring of LPG at Tema Oil Refinery (TOR) and ensuring that households that use wood fuel (charcoal and fire wood) for cooking adopt to the use of LPG respectively (Quaye-Foli, 2002; Anon, 2004). The promotion targeted urban households, public institutions requiring mass catering facilities and the informal commercial sector including small-scale food sellers. Extensive promotional and educational campaigns were also carried out to ensure that environmental, health and safety regulations were observed and the benefits of switching to LPG communicated to the public (Anon, 2004). The promotion of the usage of LPG as a policy by the government of Ghana was to safeguard the forests from depletion. Since the inception of this policy, there has been a consistent effort by Government to subsidise the commodity so as to make it affordable for use in the homes. The high subsidy on the LPG must be managed in order to make it attractive for investors to venture into LPG business (Kotoku, 2013). In spite of this intervention by the Government, the country's energy needs still rely mainly on wood fuel for cooking. Wood fuel accounts for 73.9% of energy needs according to the 2010 population and housing census (Anon, 2012). The figure clearly confirms the fact that wood fuel remains the country's biggest source of energy supply, employing thousands of people in the country. Among the Government's intervention initiatives has been the setting up of a gas cylinder manufacturing company in the country; Ghana Cylinder Manufacturing Company (GCMC), to manufacture gas cylinders locally and make them available to the public at affordable prices. This intervention increased the quantity of cylinders in circulation from 80,000 in 1989 to 600,000 in 1997. The overall LPG consumption also increased from 5,267 metric tonnes in 1989 to 32,000 metric tonnes in 1996 (Quaye-Foli, 2002). Another measure was to encourage private sector participation by way of investment in the storage and distribution network of petroleum products including LPG throughout the country. This has led to the springing up of over 400 private gas refilling stations nationwide and offering employments to many Ghanaians. The programme which is to encourage people to change from the use of wood fuel to LPG has yielded positive results. Before the government's LPG promotion programme, according to the Ghana Living Standards Survey (GLSS) of 1988, only 4.8% of the population in Accra used LPG, 0.8% of the population in other urban areas used LPG and nobody in the rural areas used LPG. As at the year 2000, according to a survey by Ghana Living Standards Survey (GLSS), the percentage of LPG users in Accra has moved from 4.8% to 22.7% of the population in Accra, 0.8% to 5.2% of the population in other urban areas and 0% to 0.6% of the population in the rural areas (Quaye-Foli, 2002). According to 2000 Population and Housing Census, 21.8% of the population in Greater Accra used LPG as cooking fuel whilst 4.8% of the population in Ashanti used LPG (Anon, 2004). As at the 2010 Population and Housing Census, the use of LPG as cooking fuel in Greater Accra has moved from 21.8% to 41.4% and 4.8% to 21.1% in the Ashanti (Anon, 2012). The Ghana LPG Promotion Programme has received good responses from citizens. It has increased the consumption level year after year except 2010. The reduction in consumption in 2010 was as a result of frequent shortages in Ghana (Figure 2).

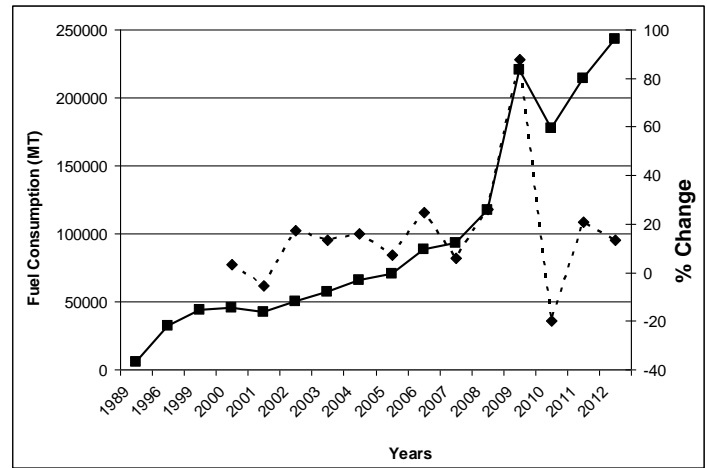


Figure 2 LPG Consumption in Ghana
(Source of Data: Anon, 2013)

4 METHODOLOGY FOR DATA COLLECTION

This section outlines methods employed for the collection and analysis of the data.

4.1 Questionnaires

Two types of questionnaires were designed for the research: one for Liquefied Petroleum Gas Marketing Companies (LPGMCS) and the other for consumers. Both closed and open ended questions formed part of the questionnaires administered to address the objectives of the research. To Wilson and McLean (1994), questionnaire is a widely used and useful instrument for collecting survey information, providing structured, often numerical data, being able to be administered without the presence of the researcher, and often being comparatively straightforward to analyse.

4.2 Data Type

Both primary and secondary data were employed for this research. Primary data were obtained from LPGMCS and consumers in Tarkwa through the administration of questionnaires. Secondary data per this research consisted of already existing data from National Petroleum Authority (NPA), published literature, media reports and government documents. According to Yin (2008), no single source of data has a complete advantage over the others and that the various sources of data collection are highly complementary. This not only increases the validity of the study, but increases the enriching and completes the knowledge and increases scope, depth, and consistency of methodological proceedings (Ghauri and Grønhaug, 2005). Responses to the questionnaires by LPGMCS or retailers and consumers were done with the help of the researchers in the form of interactions and interviews. In all, 320 people were interviewed at Tarkwa.

5. RESULTS AND DISCUSSIONS

5.1 Key Players in LPG Distribution in Ghana

The key players in the distribution of LPG in Ghana include Bulk Distributing Companies (BDCs), Oil Marketing Companies (OMCs), Liquefied Petroleum Gas Marketing Companies (LPGMCs), Bulk Oil Consumers (BOCs) and consumers (Figure 3). Bulk Distributing Companies get LPG supply from Tema Oil Refinery (TOR) and other countries to augment the supply from TOR. Bulk consumers like offshore companies, national securities, Volta Aluminium Company (VALCO), Volta River Authority (VRA) and many more receive the supply mostly from OMCS. Bulk Consumer Companies sometimes receive a direct supply from Bulk Distributing Companies. Liquefied Petroleum Gas Marketing Companies serve as the main link between consumers and OMCs because OMCs are companies who have the license to procure and sell petroleum products to the general public through retail stations.

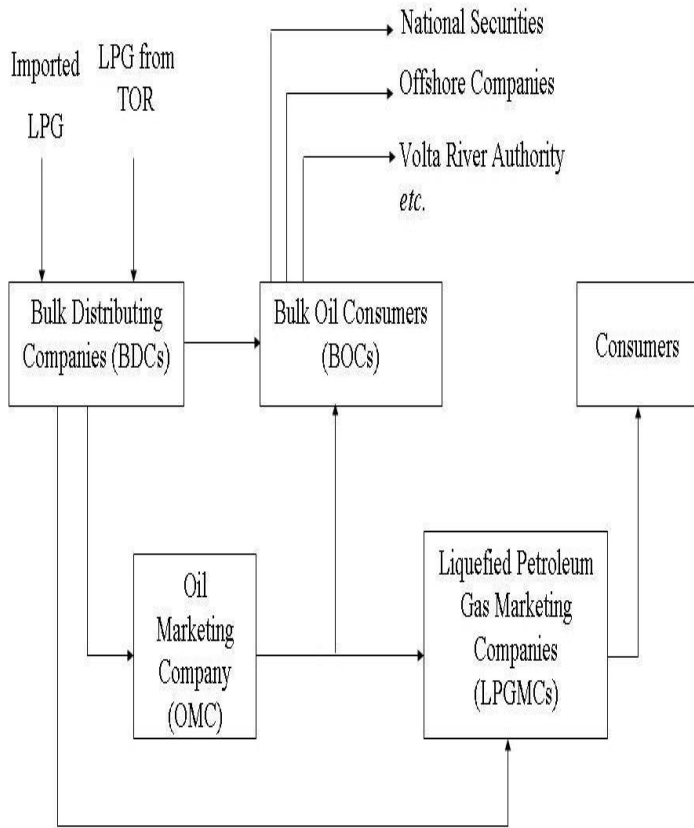


Figure 3 Key Players in LPG Distribution in Ghana

5.2 Major Users and Uses of LPG

The users of LPG were categorised into three, namely; commercial users, domestic users and industrial users. About 7.5% of the respondents were identified as industrial users; 17.5% were commercial users whilst 75% of the respondents were domestic users (see Figure 4). This reveals domestic users as the major users of LPG in Tarkwa.

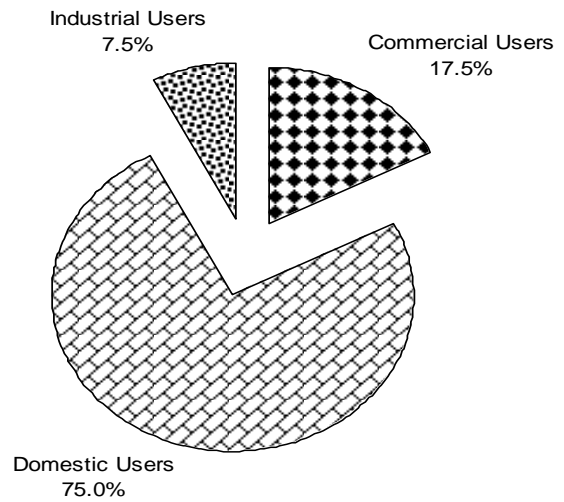


Figure 4 Categories of LPG Users

There are many uses of LPG worldwide but the inhabitants of Tarkwa use LPG basically for three main purposes; which are cooking, fuel for vehicles and welding. About 77.5% of the respondents use LPG for cooking whilst 15% use LPG as fuel for vehicles. The rest (7.5%) use LPG for welding purposes (Figure 5).

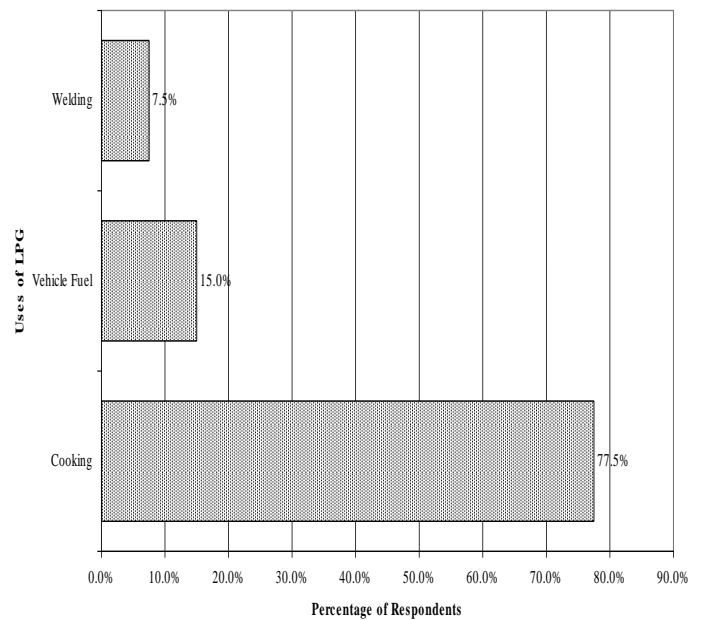


Figure 5 Main Uses of LPG

In spite of this, reasons for the diverse use of LPG for specific purposes are different from each individual's point of view. People use LPG rather than other fuels due to reasons like reliability, efficiency, environmental friendliness, convenience, affordability and many more. In this study, respondents were asked to rank the reasons why they buy LPG. Out of the 320 views sampled, 17.5% of the respondents were of the opinion that LPG is less pollutant to the environment whilst the majority (45%) of the respondents interviewed agreed that LPG is very efficient. 37.5% think it is economical/cheap (Figure 6).

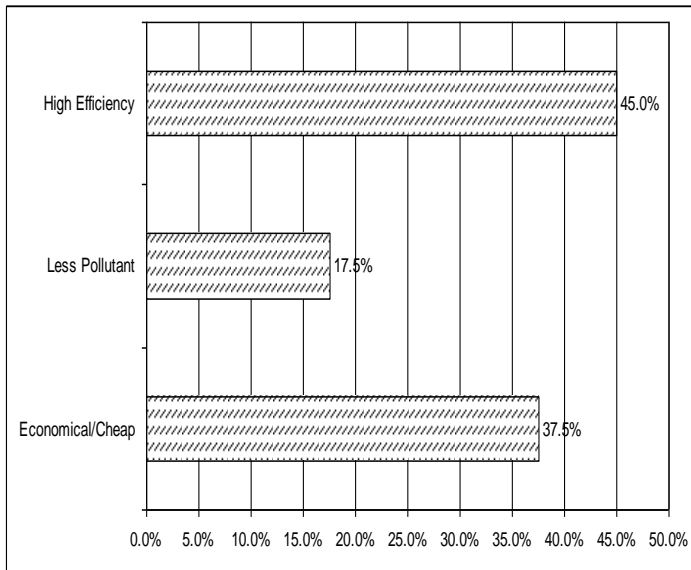


Figure 6 Reasons for Using LPG

5.3 Causes of Sporadic Shortages of LPG

Shortages of LPG can be attributed to various reasons. In this study, five main causes of LPG shortages were identified. These include: higher demand, technical, natural disasters, financial and location of LPG source from suppliers to retailers. Four of the causes were identified as disruption to the supply chain of LPG. Out of the 320 sampled views, 27.5% of the respondents agreed that shortages of LPG in Tarkwa are due to technical constraints which according to Kleindorfer and Saad (2005), result from equipment malfunctions and systemic failures, abrupt discontinuity of supply, and other human-centred issues ranging from strikes to fraud (Figure 7). This view affirms the technical challenges that were revealed by the National Petroleum Authority of Ghana during the survey. Financial and transportation disruptions had equal weight of 7.5%. Transportation constraint could be attributed to long distance from the source suppliers to retailers and vehicles break down which adds uncertainty and risk to supply chain continuity. 2.5% of the causes were revealed as natural disasters like accidents during transportation. About 55% of the respondents were of the opinion that, shortages of LPG is as a result of the growing demand of LPG for industrial and commercial vehicles. For example, most of the industrial companies who use heavy duty machines for their operations have converted their machines from diesel to LPG. Masses of hotels, restaurants and most of the chop bars which cater for the tourism industry have converted their kitchens to the use of the cleaner LPG fuel for cooking. This growing interest by commercial and industrial users confirms the increasing rate of LPG consumption from 2002 to 2012. There has been an average increase of 23.3% per year in LPG consumption from the year 2002 to 2012 excluding 2010 where there was a drop in consumption (see Figure 2). The National Petroleum Authority (NPA) of Ghana also attributed the shortages of LPG to the following constraints: berthing, pumping, storage and delivery constraints. These constraints affect mainly the supply chain of the commodity.

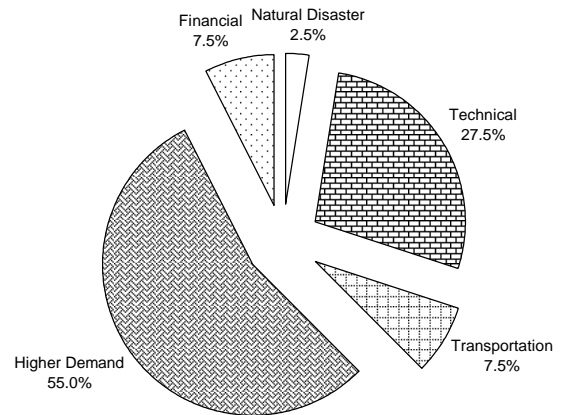


Figure 7 Root Causes of LPG Shortages

5.3.1 Berthing Constraint

Ghana's only oil jetty located in Tema is a single multi-user; this means that, the same oil jetty serves all Ghana's petrochemical needs. For instance, the jetty is used by TOR for the discharge of LPG and export of Naphtha and Residual Cracked Fuel Oil. Tema Lube Oil also uses the same jetty for the import of Base Oil, whereas some Bulk Distribution Companies use it for the import of all Aviation Turbine Kerosene (ATK) and some other petroleum products which are also in high demand. These factors result in a tight schedule with very little or no-room for slips in laycan (exact dates of arrival for vessels) (Kotoku, 2013).

5.3.2 Pumping Constraint

The single LPG pipeline from the Jetty to TOR is approximately 5 km in distance and 6 inches in diameter. This small diameter pipeline only allows a flowrate of 70 to 80 metric tonnes an hour which takes between four to five days to deliver an average parcel of LPG (Kotoku, 2013).

5.3.3 Storage and Delivery Constraints

TOR can store almost 6,500 metric tonnes and this is currently the whole capacity of the entire country. Under normal circumstance, TOR can discharge about 800 metric tonnes of LPG to the market per day. However in times of shortages, it stretches to about 1000 metric tonnes per day, by working extra hours such as weekends to meet the high demand. It must be noted that this must be done with all the safety concerns in mind (Kotoku, 2013).

5.4 Interventions to Avoid LPG Shortage

The study also found out that, most consumers and retailers have put in place measures to help curtail the effects of shortages. The most common strategy adopted by consumers in Tarkwa is the use of two or more storage containers. This strategy sometimes prolong LPG shortages as few consumers chase for the little supply of LPG in market leaving the majority of the consumers like taxi drivers, and those with one container. Whilst consumers depend on more storage devices to prevent shortages, retailers or LPGMCs depend on placing order earlier which must be supported by effective transportation system.

5.5 Effects of LPG Shortages

Shortages of LPG affect both consumers and LPGMCs in many ways. According to LPGMCs, shortages of LPG bring business to a halt and thus making payment of salaries very difficult since salaries are tied to profits made from selling the product. According to the responses from LPGMCs, shortage of LPG also creates a bad image as consumers get disappointed for not getting LPG supply after travelling from far places for LPG. Consumers were of the opinion that, LPG shortages create inconveniences in many forms. To consumers, LPG shortage creates considerable anxiety as they have to resort to alternatives like wood fuel which is not very efficient as compared to LPG. Some also complained of the health implication of using wood fuel. In case of LPG shortage, most people use alternative energy sources. In Tarkwa, most people mainly use fire wood, charcoal, electricity, kerosene or petrol as a substitute for LPG shortages. About 65% of the respondents use charcoal whilst 7% use firewood as an alternative fuel when there are sporadic shortages of LPG. In all, 72% of the respondents switch back to wood fuel. This would lead to worsening deforestation and global warming, the very problem LPG was promoted to solve. Other responses are presented in Figure 8.

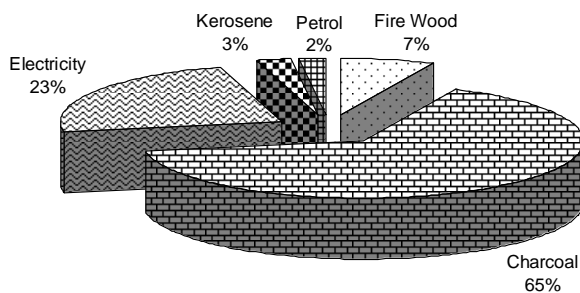


Figure 8 Alternative Fuels for LPG Shortage

6 CONCLUSIONS

From the research it could be concluded that:

- The major users of LPG are domestic consumers followed by commercial and industrial.
- The causes of sporadic shortages of LPG are mainly due to higher demand and technical disruption.
- TOR which is the major producer and supplier of LPG contributes comprehensively to shortages in the market due to infrastructural constraints.
- In an event of LPG shortages, majority of the consumers resort to the use of wood fuel.
- The common interventions put in place by consumers and retailers or LPGMCs to avoid LPG shortages are the use of two or more storage containers and the earlier request for LPG respectively.

7 RECOMMENDATIONS

Based on the conclusions, the following are recommended:

- Key players in the supply chain should be made fully aware of their responsibilities in order to take the needed initiatives that will result in positive impacts on the supply chain.
- Government should secure private sector participation to augment the mid-stream refining segment.
- LPG pipeline system from the oil jetty to TOR should be expanded to increase the flowrate of the product.
- TOR should increase the storage capacity of LPG to deal with the increasing demand of LPG yearly.

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