

LPG AN ALTERNATIVE FUEL IN BANGLADESH

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Abstract-In Bangladesh, bulk of the population is using biomass as cooking fuel. Gaseous fuels are the preferred solution instead of this traditional Biomass fuel. The use of clean fuel like liquefied petroleum gas (LPG) over the biomass based fuels used for cooking in Bangladesh would be beneficial in several ways. It has shown its prospect because of its versatility and convenient in using as cooking fuel. The Salient features of LPG are presented. Except cooking LPG may be used in many other applications, such as industrial heating, industrial generator and auto gas etc. Salient features of the LPG supply and distribution system are mentioned. On the basis of the existing situation, barriers to increasing LPG use—in particular, the problems regarding affordability, pricing and reliable distribution have been identified. Finally, on the basis of the challenges recognized, some suggestions are made regarding the policies through which the problems can be overcome.

Keywords: Biomass, LPG.

1. INTRODUCTION

In comparison to other, LPG is clean-burning, sustainable and efficient fuel. LPG is being regarded as a vital source of energy throughout the world today. Its versatility allows using with literally thousands of applications. The main features of LPG are, it is portable, can be transported and stored [1]. There are sufficient reserves of LPG gas to use for many decades. If compared on the energy-equivalent context, LPG shows lower greenhouse gas emissions than petrol, diesel, and other fuels. As one of the cleanest conventional fuels available, LPG complements renewable energy sources and technologies which depend on certain weather conditions or daylight. LPG is a natural partner for renewable energy.

1.1 ENERGY SCENARIO IN BANGLADESH

Bangladesh consumes about 100,000 ton of LPG per annum (20000 ton Govt. supply.), which is mostly used for cooking by residents in the district towns where piped natural gas connection is not available and also in some industries. LPG demand in Bangladesh has increased up to 66% to around 500,000 mt/year in fiscal 2011-12, ended on June 30, 2012, compared with 300,000 mt/year in fiscal 2010-11. At present electricity access to about 49% people in Bangladesh [2]. This electricity is mainly produced from natural gas. But, the reserve of natural gas in Bangladesh is currently under threat and this reserve may run out within twenty years next. So it is important to find out alternative sources of energy. Recent years Bangladesh government is allowing producing electricity from heavy fuel oil that is imported at a high rate. Electricity supply in Bangladesh is strongly dependent on gas. More than 67% of the power plant is run by natural gas. Due to the present

shortage of fossil fuel, government has focused on the alternative energy sources.

In Bangladesh, approximately 70% of the population lives in rural areas. As natural gas supply is not available in rural areas, so the rural people use biomass as a source of energy. More than 70% of total energy consumption is covered by biomass, mainly wood and waste. . . . Approximately, 92% of our rural households continue to use biomass as their primary cooking fuel. Approximately 6% of our entire population has access to Natural gas. Biomass fuel such as wood, cow dung is considered as a cooking fuel.

Most of the energy consumed in Bangladesh comes from traditional sources. In Bangladesh, most of the households both in urban area and in rural area use biomass such as wood, cow dung, jute sticks and other organic wastes for cooking. Supply of electricity is not available though and demand cannot be met. In the rural areas, where more than 70% of the population lives, only about 25% have electricity [3]. Approximately 39.5% of total population of Bangladesh use kerosene as a fuel for lighting [4]. Kerosene, electricity, biomass and candle are used as the energy sources in the rural area. Power generation in Bangladesh hugely depends on natural gas. The share of renewable energy in Bangladesh is only 0.5% [5]. But, in recent years, supply of natural gas has become inadequate due to reducing existing gas reserves and non-exploration of new gas reserves. The uncertainty has been approaching development of further gas based power generation expansion program. Considering this situation, the government has diversified the fuel mix and under the new generation expansion plan substantial proportion is from liquid and coal based. [2]

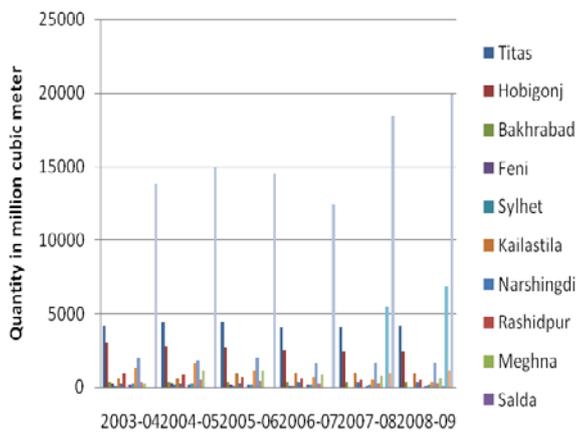


Fig. 1: Year wise production of natural gas in Bangladesh [6]

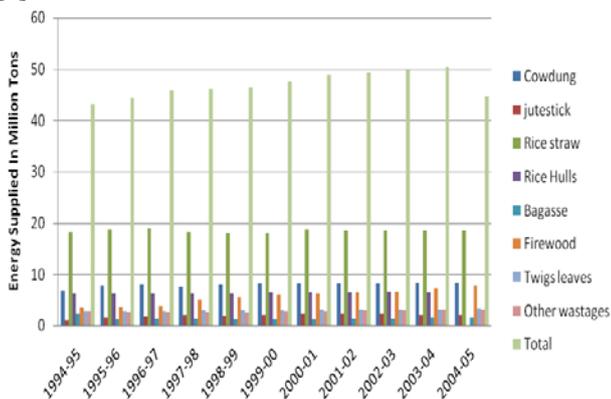


Fig.2: Energy Supplied by traditional fuels in the unorganized sector [6]

Table 1: A comparative analysis of liquefied petroleum gas (LPG) and other fuels

Fuel	Calorific Value (kcal/kg)	Price (Tk/Kg)	Rate (Tk/1000 BTU)
Furnace Oil	10000	60	1.52
Diesel	10500	80	1.92
LPG	11500	95	2.53
NG	8600	39	1.14
CNG	8350	29	0.885
Coal	7502	14	0.46
Wood	2500	5	0.5

In Bangladesh, LPG can be acquired, from two plants – Kailashtilla LPG plant, Sylhet and Eastern Refinery plant, Chittagong. Recently in Bangladesh, 22 number Of prospective company has given permission for setup condensate refinery plant from where LPG can be obtained. [7]

Approximately, 48-50 lac LPG Cylinder are being consumed by people all over Bangladesh yearly. The total production of local LPG bottling companies is being sold

fully every month and there is no closing stock of LPG cylinder. The Govt. rate per LPG cylinder is 750 Taka but because of increasing demand, the market rate is more than 1100-1200 taka per cylinder. [7]

1.2 HISTORY OF LPG

In 1910, Dr. Walter Snelling, the U.S. Bureau of Mines experimented gasoline to observe its high evaporation rate and revealed that the evaporating gases were propane, butane, and other light hydrocarbons. Dr. Snelling built a still that could separate the gasoline into its liquid and gaseous components and sold his propane patent to Frank Phillips, the creator of Phillips Petroleum Company [8].

In 1913 the first car powered by propane ran. In 1915 people were using propane in torches to cut through metal. LPG has been used as a transportation fuel, in heavy trucks and forklift vehicles, all over the world for more than 60 years [8].

1.3 LPG AS A FUEL

LPG is the most widely used fuel now days. The two main sources of LPG are Natural gas extraction (60%) and crude oil refining (40%). Volume of vapor LPG is 250 times smaller than that of the liquid LPG, Which facilitates the storage of LPG. Over half of the world's population still relies on wood, crop waste, or even dried dung to provide the energy for cooking. That contaminates the world's environment to a great extent. In these cases LPG may be better alternative. Moreover, LPG emits 60% fewer GHGs than electric coil cook tops, 50% fewer emissions than some biomass stoves and 19% fewer GHGs than kerosene stoves. LPG has numerous advantages over biomass. Our reliance on biomass energy whatever in cooking or industrial sector, such as firewood and charcoal, has results in deforestation and substantial indoor pollution. That causes so many health hazards to the human. However, the recent uprising concerns on Environment lead most of the users to switch to cleaner fuels, such as liquefied petroleum gas (LPG). Using data on four cooking fuels (charcoal, firewood, LPG, and kerosene) the most preferred fuel is LPG followed by charcoal, with kerosene the least preferred. But due to the price it is not widely used in many countries as it should be.

LPG can be used as a reliable source of energy for a range of heating applications, including central heating, water heating, heated swimming pools and air conditioning; propellant in the aerosol industry, it can also be used for Cement manufacturing process, cutting, heating and melting in metal industry, in boiler and dryer. The need for using cleaner fuels has already been established. However, numerous challenges are faced when considering the increased use of LPG; these include ensuring adequate supply and accessibility, increasing affordability, effective pricing policies, and reaching the people who are now dependent on collected biomass. LPG is more efficient and environmentally more beneficial in comparison of traditional biomass, so that would enable reducing the extra labor and good health

For those who are involved. The main reason of its efficiency is it can provide heat from input. The quality of

life has improved on this way. Moreover, it also save the time that allows people for more productive pursuits.

1.4 LPG AS A COOKING FUEL

Different Types of fuel have been used for cooking throughout the world, ranging from solid fuels to liquid to gas. Gaseous fuels, followed by light liquid fuels, are considered to be the cleaner varieties because of the fact that, they possess the characteristics with low pollutant formation and emissions during handling and use. Traditionally, gaseous fuels are fossil fuels extracted from petroleum or natural gas, and their usage cannot be considered sustainable in the long term.

There are several factors that determine the choice of LPG as a cooking fuel. These are household income level, availability and the price of LPG. But the price and the availability of the alternative fuels are also important to choice LPG for cooking purpose. Households with the upper income ladder, shifts from biomass fuel to kerosene and then to LPG. With increasing income consumers can more easily make payments for highly priced fuel such as LPG. As a result; they can be facilitated by a fuel of higher initial cost options such as LPG whose higher fuel efficiency allows for future saving in operating costs. On the other hand, at the lower income levels, people use cheaper biomass, as their income level prevents the purchase of high price fuel.

In Bangladesh, there is a rural-urban incongruity in its choice of cooking fuel .Most of the rural households in this country continue to use biomass as their primary cooking fuel. Because of low cost and availability of the biomass fuel, it is widely used by the village people. Moreover, the lower rural people find greater difficulty in obtaining refueling the LPG cylinders. In contrary, the urban people prefer cleaner and convenient fuel. Many people are using cleaner fuel and moving away from kerosene stoves and firewood or cow dung fueled stoves. Though, some poor households in urban area still use biomass as their cooking fuel. The combustion characteristics of gaseous fuels are suitable for cooking purposes because of the ease and safety of operation and combustion control. These features have allowed for the development of high efficiency and low pollutant emission stoves. In addition, they favor ease of global distribution through either pipeline or bottles.

At the present time, natural gas, liquefied petroleum gas (LPG) and kerosene are the clean fuels favored internationally for domestic cooking. Replacing traditional fuels reduces deforestation, protects users' health by reducing smoke and soot, and allows time for people to pursue education and other productive activities. Stovetop cooking is one of the world's most extensive energy-consuming activities. Consumers in industrialized countries choose from numerous stovetops and ovens using LPG, natural gas, and electricity.[1]

As a reliable energy supply, LPG is widely used in hotels and restaurants. LPG is the preferred choice for many restaurants as it provides immediate heat on ignition, removing the need for a warming-up period. One of the important features of LPG is it can produce heat that responds quickly to change in setting and propagates the heat more broadly across the base of cooking appliances.

Furthermore, LPG burns efficiently without producing black smoke and leaving no spot on cooking instruments.

For developing rural communities LPG can provide a first modern alternative to traditional cooking fuels (e.g. firewood, charcoal, dung), providing a better quality of life and more importantly, allowing people to spend less time on collecting fuel and enabling them to pursue different value-added economic activities within the community.[1]

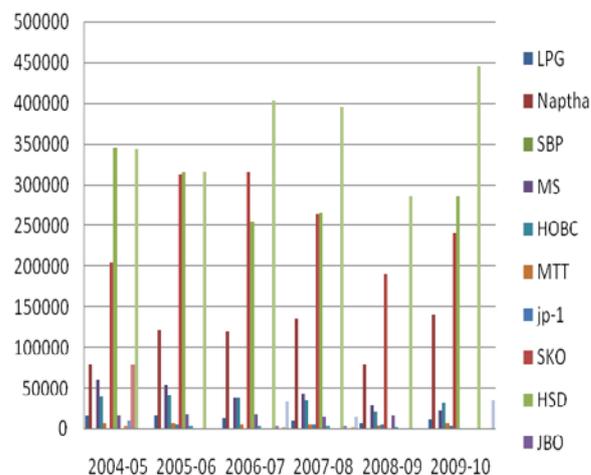


Fig: 3 ERL production of six years (2004 -2010)[6]

One of the main advantages of LPG is that it is portable. So with various sizes of containers may be used to store it.LPG can be transported anywhere in any sizes of container. In all over the developing world, LPG is distributed in many sizes of containers.

2. USES OF LPG IN DIFFERENT COUNTRIES

LPG is currently the third most commonly used transportation fuel in United States of America, behind gasoline and diesel. It is also used for home barbecues, vehicles, and house cooking in many countries. LPG has been used mostly in fleets, school buses in different places of Las Vegas, and Los Angeles, sheriff and police cars, and many other on-road fleet applications. Many non-road vehicles such as industrial forklifts and farm vehicles are run on LPG. In Tokyo all taxis are required to run on propane to reduce urban pollution. Other countries widely using LPG include Australia, Canada, the Netherlands, Italy, and Japan.

Presently, major auto manufacturers and aftermarket converters offer on-road vehicles that operate on both LPG and gasoline. These vehicles are called bi-fuel or dual-fueled vehicles, and can manually be switched between LPG and gasoline. If the engines unable to operate on LPG because of low fuel/low pressure, the engine will automatically switch over to gasoline without engine stall or hesitation. These vehicles have both LPG and gasoline tanks on-board. There are many new-model vehicles presently offered that operate exclusively on LPG.

The worldwide annual growth rate of LPG demand is approximately 3.7% during the 1990. The largest rates in the residential and commercial category will be in India and China. In 1985, 5% of the world's residential-

commercial LPG consumption was in these two countries. [1]

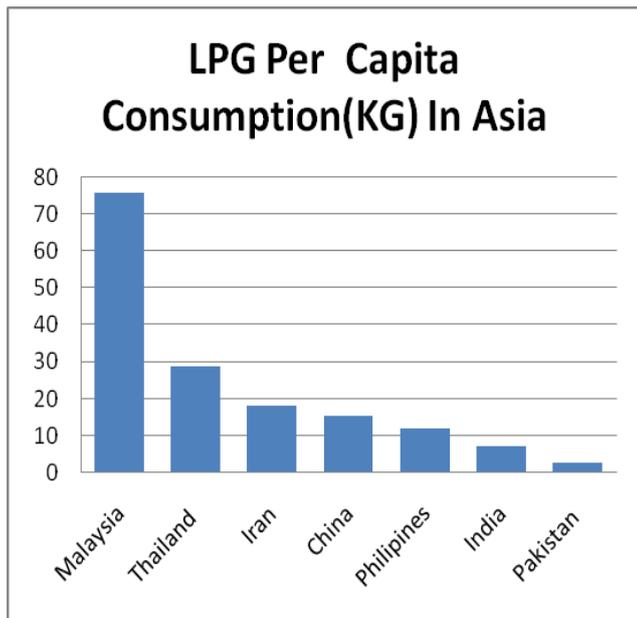


Fig. 4: LPG consumption in Asia[9]

3. POLICY FOR USING LPG AS A DOMESTIC COOKING FUEL IN BANGLADESH

It is very important to choose the appropriate fuel while discussing about the clean cooking fuels for all households. If the government wants to encourage the use of LPG then the issues concerning the price and delivering of LPG must be addressed. Furthermore, if the relative cost of LPG and other fuel are calculated after reckoning their calorific values and the efficiencies of the relative stoves or burners, it is found that LPG has numerous advantages over biomass fuel, like, higher efficiency, less pollution, therefore less cooking time, improved health and protection of deforestation (some areas). However, it seems that factors like beneficial effects on health are not only being considered in the household consideration. But it is also important to create public awareness that lead to introduce the “clean fuel” factor into the account. Another important factor to be considered is the use of more than one fuel for cooking. There are some households which are using more than one fuel, with one fuel for main meal and others for other meals and heating. In these cases social benefits of switching to cleaner fuels increase only partially. But the partial shift may eventually lead towards a complete shift, efforts to promote such shift is beneficial.

If the objective is to address the fuel in the rural areas where biomass supply is not available, it may be difficult to attain with the poorest households. So promotion of LPG remains confined for those on the higher income level. The same picture is true for the urban area also. To overcome the challenges to enhance the domestic use of LPG several issues would have to be considered when policies for the delivery will make. To create the demand of LPG- pricing, financial options and public awareness are to be considered, and on the supply side safety,

security, regularity and effective distribution are the foremost important factor.

In case of LPG marketing, several promotional activities may encourage the purchase of customers by lowering the amount of each cash outflow. In this way LPG could be access to poor household. To overcome the challenges of price, it is recommended to provide subsidy for LPG.

When estimating the price of LPG, it is important to consider the relative prices of other fuels, this could create inter fuel shifting.

The availability of the LPG in rural areas has to be improved in the long run. Technologies that control the use of LPG in a high efficiency, low emission mode, must be promoted.

The role of the government is very important to ensure safety in setting standards. Safe, economic and correctly filled cylinders are very important for the LPG users. It is important to make sure that cylinders are properly filled and checked. Cylinder cross filling should be completely stopped by implementing strict rules. Consumers’ safety also has to be ensured, otherwise, accident may occur, especially where a large number of operators are working together.

4. SUMMARY

LPG is considered one of the most important alternative sources of fuel both in domestic and industrial sector because of its cleanliness and better efficiency. Especially substantial convenience as cooking fuel makes it more popular. In particular expanded access to LPG can have profound and beneficial effects on the economy, environment and the quality of life LPG may be the solution to provide modern energy on a large scale.

The availability of LPG in rural areas has to be improved in the long run. To switch towards cleaner fuels are the factors of affordability, awareness and acceptability. Governments, Industry and social activists must work collectively to soothe the barriers to use cleaner fuel like LPG. Additional attention should be given to the LPG users for redistribution of National wealth to all citizens. A special incentive for LPG users directed to lower income households is another way to enhance the consumption of LPG. Demand of LPG use in the domestic and industrial sectors will be increasing day by day. Policy makers should be aware of this and should take necessary steps in overcoming the barriers.

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