

Review

The perspective of Nigeria's projected demand for petroleum products

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Accepted 13 November, 2013

Nigeria is Africa's energy giant, and the most prolific oil-producing country in the continent. Export of petroleum is the mainstay of the Nigerian economy and the major source of revenue for the country. The petroleum and natural gas sector accounted for about 19.39% of the nation's GDP in 2009. The sector also contributed over 95 and 70% of export earnings and total government revenue, respectively. Nevertheless, the country suffers from an inadequate supply of usable energy due to inadequate development and inefficient management of the energy sector. The estimated daily demand for petroleum products in Nigeria as at 2010 which are: petrol, 30 million liters; dual purpose kerosene, 10 million liters and diesel, 1.8 million liters, and are expected to grow. Currently, most of Nigeria's domestic petroleum products needs are met through importation, as the domestic refineries are not capable of supplying enough to meet the ever growing demand. This paper attempts to give an overview of the petroleum sector, projected energy demand for these petroleum products for the country.

Key words: Petroleum products, energy utilization, energy sector, demand, consumption.

INTRODUCTION

Prior to the 1960s, the pattern of energy demand and consumption in Nigeria was predominantly non-commercial energy sources apart from coal, but the pattern has drastically changed since the exploration of petroleum reserves and the production of crude oil in December 1957, with the first exports in 1958. Currently, Nigeria is the largest oil producer in Africa, the world's eighth largest exporter of crude oil and a member of the Organization of the Petroleum Exporting Countries (OPEC) since 1971 (Oyedepo, 2012). Nigeria had about 37.2 billion barrels of proven oil reserves as at January, 2011 (OPEC ASB, 2012). The total production as at 2010, including lease condensates, natural gas liquids and refinery gain, was averaged slightly above 2.46 million bbl/day.

The Nigerian National Oil Company (NNOC) was

established in 1973 and transformed to the Nigerian National Petroleum Corporation (NNPC) in 1977. NNPC operates in conjunction with other major players in the sector that is the Multi-national Oil Companies (MNOCs) under the joint ventures (JVs) or production sharing contracts (PSCs) agreements. They include: Shell, ExxonMobil, Chevron, Total, Eni/Agip, Addax Petroleum, Conoco Phillips, Petrobras and Statoil Hydro. Shell has been working in Nigeria since 1936 and currently has the highest crude oil production capacity of about 1.2 million bbl/day. Also indigenous companies operate in the marginal fields of the Niger Delta region.

In the downstream sector of the industry, the NNPC has four domestic refineries, of which two are located in Port Harcourt, both having a total production capacity of 210,000 bpd. The other two are located, one each in

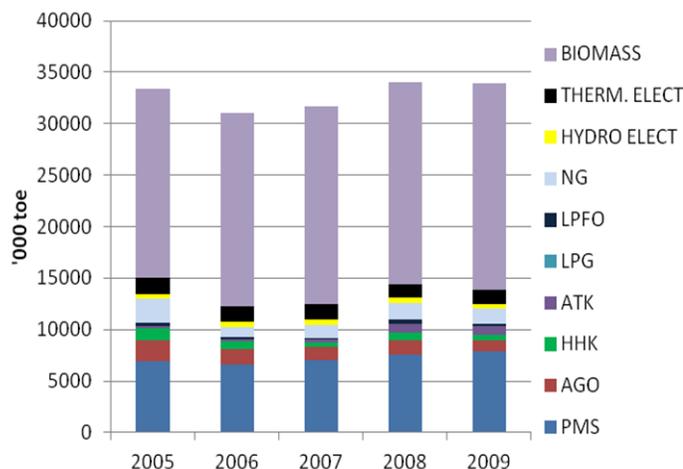


Figure 1. Consumption of energy sources. Source: IAEA/ECN (2009).

Kaduna and Warri, with production capacities of 110,000 and 125,000 bpd, respectively. These domestic refineries have total combined capacity of 445,000 b/d. However, their combined output is below 40% for most of recent years, leading to much dependence on imports. A comprehensive network of pipelines and depots strategically located throughout the country links these refineries. In recent times, private sector participation is fast evolving with numerous tank farms and retail outlets built across the nation.

The objective of this paper is to shed light on key issues related to the local production, consumption and future demand of petroleum products in Nigeria over the period of 2009 to 2035, and volatile oil and gas prices. This will be achieved by analyzing the structure of energy utilization and petroleum products demand projection in Nigeria.

STRUCTURE OF ENERGY UTILIZATION IN NIGERIA

Nigerian consumption of energy resources was predominantly of non-commercial energy, namely, fuelwood, charcoal, agricultural wastes/residues, all referred to as biomass and solar radiation. The major commercial fuel was coal, which was used by the railways and for power generation. Coal production peaked in 1959 and has experienced continued decline since then, due in part to the introduction of diesel power engines in the railways in the 1960s and eventual stoppage of power production from coal. The first gas turbine power plant was built at Afam, near Port Harcourt, in 1965 with an initial capacity of 56 MW.

The structure of energy utilization drastically changed when modest contributions started coming from petroleum products (petrol and diesel) and electricity

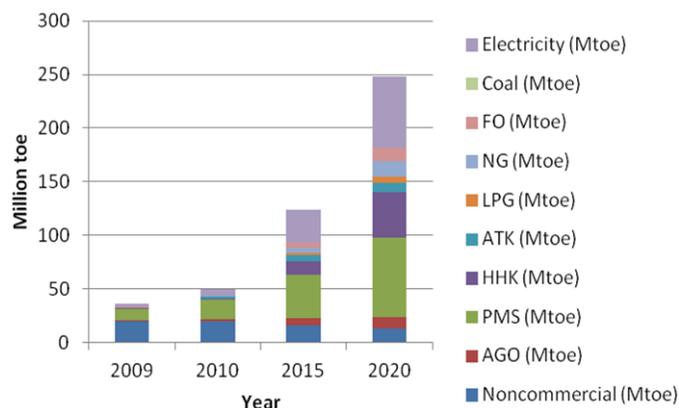


Figure 2. Consumption of energy by source types. Source: IAEA/ECN (2009).

(from coal and diesel generators). The first domestic refinery was commissioned in Port Harcourt in 1965, with a capacity of 60,000 bpd. Also, the first hydroelectric power plant, Kainji, started operations in 1968 with an initial capacity of 320 MW. These developments signaled the beginning of the change in the structure of the energy sector from coal to petroleum dominance of commercial energy. They also signaled the beginnings of the eventual dominance of the economy by the energy sector, especially by the oil and gas sub-sector. Figure 1 shows the consumption of energy sources by type over the period 2005 to 2009.

Energy utilization and demand projection in Nigeria

Hitherto, fuelwood and charcoal provided the single largest share of energy consumption in the country (Sambo, 2012). Over the period 2009 to 2020, the share is expected to drastically change, going by the Vision 20:2020 dream of the government for Nigeria to be one of the twenty most developed nations in the world by year 2020 (Figure 2). Petroleum products accounted for the next most highly consumed energy source with 36% in 2009 and are expected to account for 61% in 2020. The petroleum products consist mostly of premium motor spirit (PMS) and automotive gas oil (AGO) commonly referred to as petrol and diesel, respectively, for transportation and power generation. It also includes household kerosene for cooking and lighting in households; aviation kerosene for air transportation; fuel oil for generating process heat in the industries; and liquefied petroleum gas for cooking and heating in households.

Other energy sources include electricity which accounted for 8.5% in 2009 and is expected to account for 27% in 2020 (thermal and appliances uses), natural

Table 1. Capacities of Nigerian Refineries.

| Refinery | Year commissioned | Daily capacity, barrels stream per day (BSPD) | Annual capacity, Barrels per year (BPY) |
|--|-------------------|---|---|
| Kaduna Refinery and Petrochemical Complex (KRPC) | 1979 | 110,000 | 40,150,000 |
| Warri Refinery and Petrochemical Complex (WRPC) | 1978 | 125,000 | 45,625,000 |
| New Port Harcourt Refinery and Petrochemical Complex (NPRPC) | 1989 | 150,000 | 54,750,000 |
| Old Port Harcourt Refinery and Petrochemical Complex (OPRPC) | 1965 | 60,000 | 21,900,000 |
| Total | | 445,000 | 162,425,000 |

Source: Report No. ECN/EPA/2011/01.

Table 2. Petroleum products demand projections (2009 to 2035).

| 7% Reference scenario | 2009 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|-----------------------|---------|----------|----------|----------|----------|-----------|-----------|
| AGO(ML) | 1130.44 | 1582.18 | 4600.29 | 8347.29 | 12454.38 | 17791.56 | 27816.03 |
| PMS(ML) | 9505.62 | 11525.48 | 26967.39 | 52536.75 | 74168.61 | 105290.60 | 143080.50 |
| HHK(ML) | 306.06 | 389.00 | 3510.00 | 8521.10 | 14354.21 | 21027.58 | 33277.09 |
| ATK(ML) | 50.00 | 75.00 | 278.00 | 517.61 | 730.73 | 1037.35 | 1409.67 |
| LPG(ML) | 40.09 | 50.38 | 598.38 | 1547.30 | 2607.55 | 3799.58 | 5691.54 |
| FO(ML) | 120.01 | 160.00 | 1800.00 | 4632.07 | 7806.10 | 11374.64 | 17038.51 |

Source: IAEA/ECN (2009).

gas 0.5% in 2009 and 6% in 2020 (steam production and feedstocks), in the manufacturing industries. However the bulk of the natural gas utilization is consumed in electricity generation. Furthermore, the use of natural gas as feedstock for liquefied natural gas production for export later became predominant.

PETROLEUM PRODUCTS DEMAND PROJECTION

The estimated daily demand for petroleum produce in Nigeria as at 2010 are petrol, 30 million litres; kerosene (DPK), 10 million litres and diesel, 1.8 million litres, and this is expected to grow (NNPC-ASB, 2009, 2010). The combined crude oil refining capacity of all the domestic refineries in Nigeria, which is about 445,000 barrels per day (about 162.425 million barrels of oil per year) has never reached full production capacity due to poor maintenance and operational failures fall short to meet this requirement. Table 1 gives the individual refining capacity of the refineries and their names/locations.

An analysis of the energy demand over the period 2009 to 2035 by the Energy Commission of Nigeria, using the Model for the Analysis of Energy Demand (MAED) developed by the International Atomic Energy Agency (IAEA), for gross domestic product growth rates of 7% (Reference Scenario) and 13% (Optimistic Scenario, which is the growth rate required to achieve Vision 20:2020) respectively, indicated increased demand for petroleum products in the country. Tables 2 and 3 show the projected demands.

Surveys and analysis from ECN of various reports showed that about 20% of the current consumption of petrol in the country is consumed for captive electricity generation in the household and services sectors (ECN, 2009). It is assumed that industry consumption of PMS for captive electricity generation is negligible and that all captive power generation in industry is by diesel generators. If grid electricity supply becomes more available and more accessible to households and industry, then the national demand for petrol and diesel for captive power generation will reduce gradually. Hence total demand for petrol and diesel consumption will be less than the projected values for all the years in the study period (Energy Commission of Nigeria, 2011).

ISSUES AND THE WAY FORWARD

Vision 2020 envisages that the capacity of domestic refineries will increase to 750,000 b/d by 2015 and 1,500,000 b/d by 2020. A comparison of the annual production capacities of petroleum refineries to be established according to the Vision 2020 Blueprint with the refining capacities required for the production of energy petroleum products projected for the Optimistic II Scenario is presented in Table 4. It shows that domestic production of petroleum products is consistently lower than demand in the period and the country will still depend on import of petroleum products. Over this period, 2009 to 2020, Nigeria is expected to consume a total of 3.4 billion barrels of crude oil locally out of the

Table 3. Petroleum products demand projections (2009 to 2035).

| 13% Optimistic scenario | 2009 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| AGO(ML) | 1130.44 | 2353.90 | 7296.76 | 12532.32 | 22799.80 | 42667.57 | 83580.46 |
| PMS(ML) | 9505.62 | 16579.54 | 36385.46 | 66368.75 | 103429.80 | 164805.40 | 294224.30 |
| HHK(ML) | 306.06 | 782.00 | 6599.00 | 22050.61 | 43266.41 | 75631.97 | 119400.00 |
| ATK(ML) | 50.00 | 120.00 | 440.00 | 653.88 | 1019.02 | 1623.71 | 2898.79 |
| LPG(ML) | 40.09 | 71.84 | 1011.46 | 3099.20 | 6947.16 | 12380.38 | 22066.68 |
| FO(ML) | 120.01 | 270.00 | 3380.00 | 9277.94 | 20797.42 | 45443.40 | 95569.90 |

Source: IAEA/ECN (2009).

Table 4. Comparison of projected demand for petroleum products with Refinery output in Vision 2020, Million BOE.

| Petroleum products (Units are in MBOE) | 2009 | | | 2015 | | 2020 | |
|---|-------------|-------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|
| | Ref | Optimistic II Scenario | Vision 2020 Blueprint | Optimistic II Scenario | Vision 2020 Blueprint | Optimistic II Scenario | Vision 2020 Blueprint |
| Premium Motor Spirit | 218.61 | 294.96 | 84.22 | | | 538.01 | 168.44 |
| Jet Fuel kerosene | 27.01 | 42.76 | 8.25 | | | 63.54 | 16.50 |
| Household kerosene | 49.35 | 92.78 | 25.33 | | | 310.01 | 50.66 |
| Diesel | 47.47 | 75.30 | 47.73 | | | 129.32 | 95.47 |

Source: Report No. ECN/EPA/2011/01.

total reserve of 37.2 billion barrels. Moreover, we would have exported about 10 billion barrels.

These observations raise some policy issues. The additional refineries should be designed to be more flexible in the production of refined products. There is need to encourage mass transportation to stem the growth rate of PMS demand which arises from high growth in passenger transportation demand by car. Also, government as a matter of urgent national priority must, in collaboration with the private sector, establish new refineries to meet domestic demand, as well as for export to earn more revenue.

Conclusion

For Nigeria to attain its desire of Vision 20:2020, all effort should be geared towards attaining self sufficiency in meeting our petroleum products demands through local refining. This could be achieved by properly maintaining all the local refineries and building new ones both publicly and privately. All policies and institutional framework should be put in place to discourage importation of petroleum products, while encouraging importation of efficient energy consuming appliances and vehicles into the country.

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