Nigeria's Electricity Sector- Electricity and Gas Pricing Barriers

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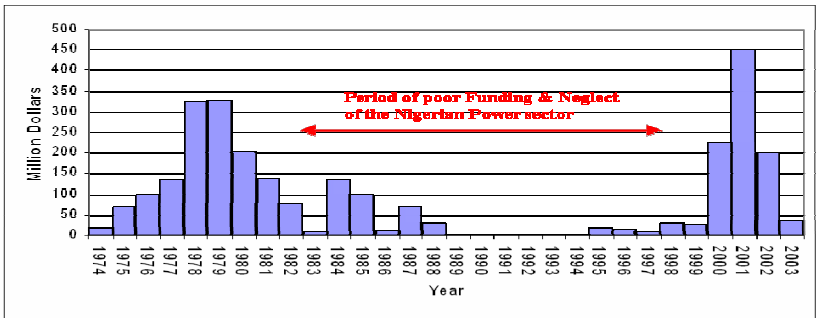
Nigeria has tremendous energy resources in the form of abundant gas, water and mineral resources. Yet, it is highly energy deficient. Per-capita electricity consumption is only 136 KWh compared to other neighboring West African countries, such as Ghana and Ivory Coast, which are not endowed with such resources, with per-capita electricity consumption of 309 KWh and 174 KWh respectively. It is ironic and unfortunate that Nigerians have to face severe petrol and diesel shortages and are subjected to frequent long queues at the gas stations, when their country contributes a significant share of the World's oil production[1]. That the people of Nigeria are not able to harness the benefits of their country's rich energy wealth is a classic developmental paradox. This situation poses a complex challenge for the Nigerian Government and raises important questions on relevant economic policies in play. While several factors including weak governance, poor institutional capacities, inadequate investments account for this situation, this paper will confine to a brief analysis of the electricity and gas sectors with an emphasis on pricing issues which are proving to be key economic barriers. The relevance of appropriate energy pricing is more pronounced against the backdrop of Nigeria's rich oil and gas wealth. The Nigerian case emphasizes the importance of cost reflective market based energy pricing even in the case of resource rich countries.

Nigeria's Electricity Sector

With only 3800 MW against an estimated demand of 10,000 MW, Nigeria has considerable suppressed and unmet demand. About 40% of Nigeria's population has access to electricity[2] with the rest of around 90 million people living in the dark. The country faced a long bout of underinvestment and poor planning in electricity infrastructure from 1981-99. Only 19 out of 79 generation units were operational in 1999, and the average daily generation was only 1,750 MW. No new infrastructure was built in the country for over a decade (1989-99), and the youngest power plant built was in 1990. Less than 2% of the Transmission Development Plan (1995 – 2005) was implemented, with the last transmission line built in 1987[3]. As a result, the existing power infrastructure is mostly in a dysfunctional state.
In its response to this grim situation, the administration, in 1999 embarked on an ambitious program to improve the generation, transmission and distribution capacity in the country. The salient features of this program were as follows:

(a) Increase in generation capacity, through the rehabilitation of existing plants and building of new plants (new PHCN[4] or NIPP[5] plant, or third-party licensed IPPs).
(b) Reinforcement of transmission network, through the rehabilitation of existing system and building of new grid stations and transmission lines.
(c) Rehabilitation and extension of the distribution system, initiation of pilot demonstration projects and expanding rural electrification schemes.
(d) Initiation of sector reforms, including inter alia enactment of enabling legislation, restructuring of the monolithic utility NEPA, establishment of the independent regulator, and solicitation of private-sector investments.



Source: PHCN

Figure-1: Investments in the Power Sector

Hence, investments in the power sector over the last three decades have followed an irregular pattern. While substantial investments were made in the years following the oil price shocks of the seventies, there was a period of neglect which resulted in a crisis-like situation in the nineties. It has been only in the last five or six years that the power sector has received growing attention from FGN, even though the bulk of the results are yet to materialize (Figure-1).

Modest but steady improvements witnessed during 2000-2005 could not be

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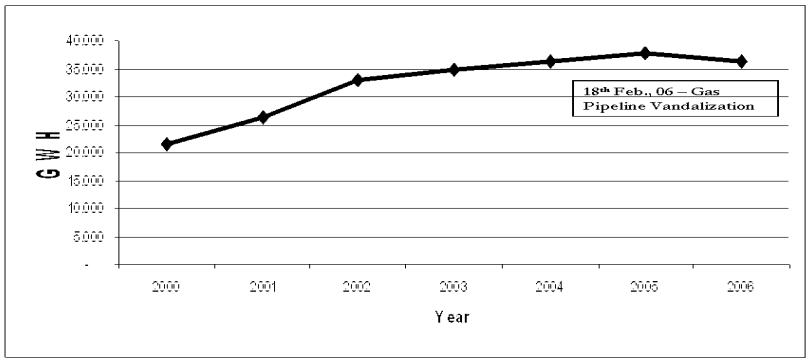
See footnotes at end of text.

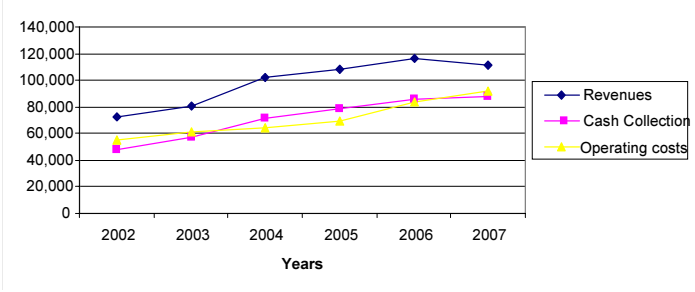


Source: PHCN

Figure-2: Energy Generation, 2000-2006

sustained for a variety of reasons (Figure-2). The vandalization of gas pipelines feeding major power plants brought a major reduction in overall electricity generation. The situation was not helped by the low rainfall and near-drought conditions affecting seriously the hydro-generation capacity in Nigeria. Some of the Government owned plants need urgent refurbishment to operate at a higher capacity. Other plants face irregularity of gas supply and operate much below their potential supply capacity.

Reforms in the power sector, since the new Electric Power Sector Reform legislation in 2005, resulted in unbundling of the Power Holding Company of Nigeria (PHCN) into 18 companies (6 generating, 1 transmission, and 11 distribution companies). As a result of some of the initiatives, modest improvements were witnessed in the sector. The revenue growth in the sector has been substantial, from about N80 billion in 2003 to about N110 billion in 2007. This has mostly been because of collection improvement and also due to capacity addition. Both distribution and transmission losses have steadily declined over the last few years, with investment in advanced technology. However, retail electricity prices have not traditionally kept pace with inflation in Nigeria and were last adjusted in 2002. As a result, the Nigerian electricity sector is going through a financial crisis which is causing great inconvenience to the population.



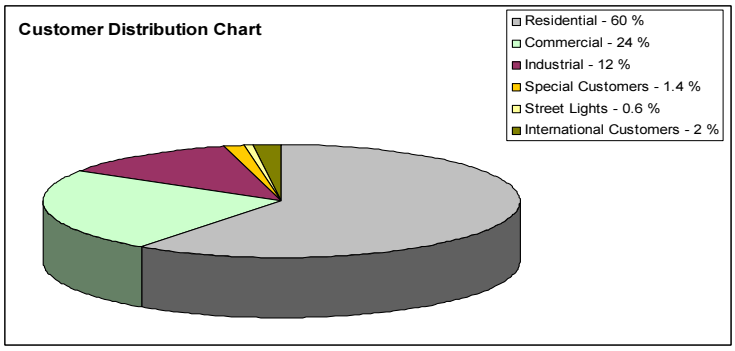
Source: PHCN

Figure 3: Operating Cash Flows in the Electricity Sector

The chart below provides a snapshot of the state of affairs in the sector.

Electricity tariffs

The retail electricity tariff in Nigeria consists of 3 elements. (a) Energy Charge - for variable costs recovery, (b) Demand Charge - for applied pressure (load amount) on the system and (c) Fixed Charge -for capital costs recovery. Electricity consumers in Nigeria are divided into 6 categories, namely, residential, commercial, industrial, street lighting, customers on special tariff, and International Customers. Each of the groups is sub- divided into classes resulting in 19 classes of customers as depicted in the figure below.



Source: NERC

Figure 4: Electricity Customer Distribution in Nigeria

The residential share of the customer base is about 60% of the total revenue share, as seen in the chart above. However, in terms of revenue collected, the share of residential customers is not proportionately as high due to two reasons. First, there is a differential tariff structure for commercial and residential customers and residential customers have a lower tariff level. Second and more importantly, a large part of residential customer supply is unmetered, and is only billed on the basis of average consumption[6]. In the absence of proper metering, therefore, the amount billed is, at best, an estimation. Unpaid bills are substantial as evident from the high accounts receivable (595 days of sales equivalent) in FY07. These accounts receivable are accumulated year after year, with no effective policy on them and bad debt handling. About two-third of the receivable is from the private consumers category that includes residential consumers[7].

As of today, the tariff for the Nigerian electricity market is one of the lowest in the world. The current average tariff level in Nigeria is about N6.31/KWh or $4.3 US cents/KWh, which has remained constant since 2002. With increasing costs, the current tariff level has not been sufficient to meet operating or capital investment costs of the unbundled companies along with the gas supply payment and the IPP payments. Other major reasons for this deficiency are the high technical loss levels and low collection efficiencies. These two factors together, account for almost 50% of the potential revenue loss. As a

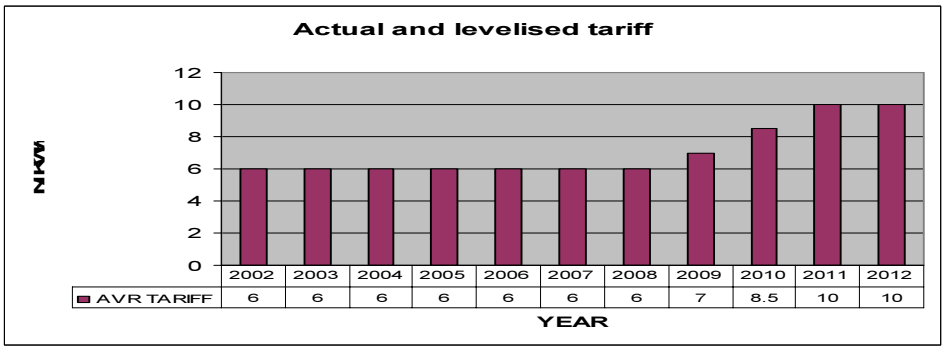
result, there is a yearly revenue gap, which has been historically met by the Government through ad hoc transfers. The recent multi-year tariff order by the regulator is an attempt to remedy the situation, where the gap is sought to be plugged by a mix of government subsidy and tariff increases.

Multi-Year Tariff Order

To address this issue, the Nigerian regulator has developed a Multi-Year Tariff Order, (MYTO), which is based on the principle of operational cost recovery, return on investment for new capital investment and replacement capital investment. The MYTO implementation will lead to an increase in tariff over the next 4 years starting in July 2009, and reaching a cost reflective tariff level of N10/Kwh by 2011. In arriving at this figure, the MYTO assumes that the generation availability will be around 10,000MW by 2010. It also assumes that the combined technical, non-technical and collection losses will drop from 45% to 30% by 2009. The improvements are expected to be a result of investments in transmission, distribution technology and collection efficiency improvements.

The MYTO is developed for each functional component of the Electricity Industry (Generation, Transmission, Distribution and Retail) each year for 15 years, with a provision for 5 yearly reviews. The MYTO is based on the principles that:

- Every unit of the supply chain should be allowed to recover its efficient costs, including a reasonable rate of return on capital.
- Prices should encourage efficient level of investment in the industry.
- Prices should be predictable and stability should be guaranteed to encourage private investments.
- Tariff structure should be transparent, easy to understand and not costly to implement.



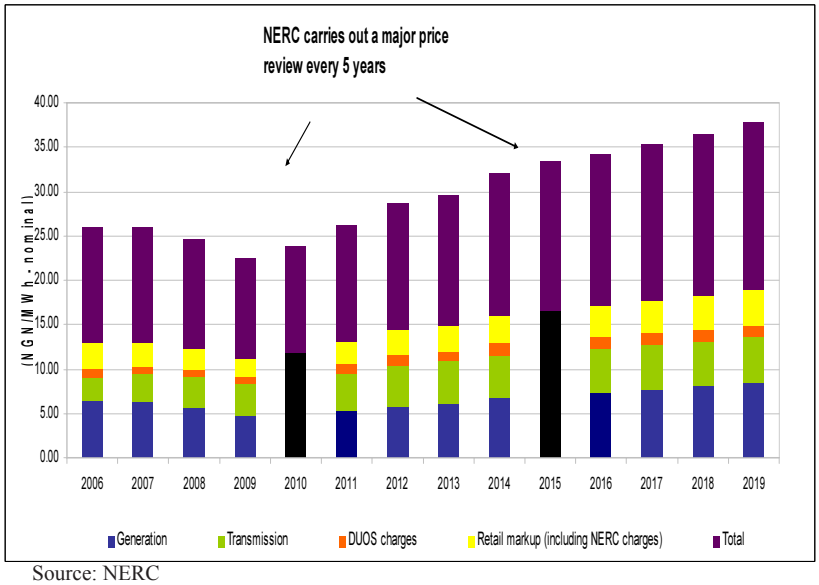
Source: NERC

Figure 5: Tariff Trajectory

- Price structure should give incentives for operating cost reductions, efficiency and service quality improvements.
- Prices should be affordable by the various classes of the society and should support Uniform National Tariff.

Implementation of MYTO

To increase the capacity available in the sector, new investments in generation and loss reduction are envisaged. NERC has also proposed a gradual introduction of cost reflective tariffs such that tariffs gradually increase to cost reflectivity over 3 years, with no tariff increases in the first year (12 months) of the period, till July 2009. The tariff levels are expected to increase to N10/KWh by 2012.



Source: NERC

Figure 6: Functional Breakup of Tariff Components

The proposed tariff re-alignment requires Government support to meet the shortfalls between the required revenue and the collected revenue, with the subsidy being sunset over 3 years; 1st Year N64.84 billion[8], 2nd Year N77.31 billion, 3rd Year N35.80 billion through a tariff equalization fund. The Government of Nigeria approved the implementation of MYTO and agreed to provide N177.95 billion over a three-year period to finance the Electricity Equalization Fund. The subsidy levels and tariffs are based upon a cost plus analysis. The following graph provides an idea of the Generation, distribution and transmission costs plus a return on

capital that form the basis of the tariff increase and subsidy level.

Tariff Design

The next challenge for the Nigerian Electricity Regulatory Commission (NERC) is to design a tariff structure that will take into account these cost reflective levels and target subsidies efficiently for the poor. It will have to take into account willingness to pay as well as affordability issues while doing so. A significant portion of the Nigerian population resorts to expensive captive generation using diesel or other costlier fuels. It is estimated that as much as 4000 MWs[9] of self generation exists in the system (more that the 3800 MW available in the grid). It is estimated that it costs around 30 U.S. cents to generate a KWh using stand alone generators. Hence a significant consumer surplus exists in the system allowing a good elbow room for the regulator to reach an across the board tariff of 10 U.S. cents per KWh in order to reach cost reflective levels as per MYTO.

Gas Pricing

The pricing of gas is a major issue in Nigeria and is very central to electricity generation, availability and retail prices. About one half of the current generation mix in Nigeria is thermal and this proportion is set to go up with a limitation on utilization of hydro capacity (further exploitation of hydro resources is difficult due to capital barriers, even though the Government has plans that are still at a conceptual stage, to develop large hydro facility at Mambilla in the north). Gas is the logical choice for power generation in Nigeria, both in terms of gas availability and capital requirements.

Nigeria has the 7th largest proven gas reserves in the world, with 182 TCF of high grade gas. It faces significant demand boom, which will alter its industrial and economic development potential. However supply significantly lags demand, threatening economic growth. Utilization of gas resources is a challenge on account of various factors such as the violent situation in Niger delta and the environmental and social issues surrounding it. Nigerian gas, though abundant, is rich gas with several chemical impurities requiring substantial processing before it can be used for electricity generation. Gas is available, both as associated gas and as dry gas in stand alone gas fields. The original contracts between the oil companies and the Government were production sharing arrangements for oil but do not cover gas. Oil companies, which are the primary producers of associated gas, want a commercial price for gas supplied to the domestic market that matches international prices. The Government, arguing that this gas is a national asset, wants the gas to be priced low, especially for the power sector in an attempt to keep the retail electricity prices low. Since the international LNG prices are more attractive, the oil companies have an incentive to divert gas to international export markets as much as they could and since they do not have an incentive to supply for the domestic market, flare the rest of the gas. The result is a terrible gas flaring situation in Nigeria. Also, consequently, the local gas processing and transmission infrastructure did not develop at all.

Inadequate and erratic availability of gas, resulting from lack of investments in infrastructure, poor planning and sabotage of pipelines, has also been a major cause of poor utilization of existing power generation capacity. The commissioning of new plants and planning of new power generation capacity is also held back due to the problems of gas supply.

In February 2008, the Government approved a package of measures to improve the medium- to long-term development of the gas sector that included a new gas pricing policy, introduction of a Strategic Aggregator, rolling out of a Gas Master Plan that identifies the future gas infrastructure network to be built by the potential investors, and an obligation for gas producers to serve the domestic market. The Government's policy mandates all oil and gas operators to set aside a pre-determined amount of gas for the domestic sector. The policy sets a penalty for default at $3.5/mcf of obligation that is under-supplied and otherwise flared, and is also not tax deductable. An environmental surcharge of 0.5 C /mcf is levied over this. The policy also stipulates that the relatively cheaper Nigerian gas will be directed to the domestic market first. The gas policy mandates a sector based pricing to match 3 categories, (a) Cost + for strategic domestic sector; (b) Netback for the strategic industrial sector; (c) Alternative fuels pricing for commercial users. Lastly, it introduces the concept of strategic aggregator, who will be responsible for the volume and price of the gas supply.

The Government's policy introduces a floor price of US$0.40/MMBtu at power plants based on a price of US$0.10/MMBtu at the well head and a transmission charge of US $ 0.30/MMBtu. The price of gas to non-power consumers is expected to cross subsidize the price to power plants resulting in a pooled price of US $ 0.80/ MMBtu to the gas producers. This arrangement of a pooled price is expected to be managed through the proposed institutional arrangement of a gas aggregator. The proposed "Gas Aggregator" will manage the gas supply portfolio and payment for gas to the domestic sector. The Gas Aggre-

gator will be the first contact point for the gas trade and will issue Gas Purchase Orders after due diligence of Sellers. Sellers make gas available to the Buyer at the Delivery Point agreed with the Buyer.

However, the price of gas for power generation is set to go up to US $ 1.00/MMBtu by 2013, by which time the cross subsidy is expected to be phased out. The Government also introduced a securitization framework to assure investment in gas supply for the power sector. Both of these steps will provide a much needed boost to gas supply to the power sector.

The short/medium term gas supply plan projects a rise in domestic gas supply from current 710mmcf/d to 2605mmcf/d by 2012. Specifically, it expects to double capacity to 1400mmcf/d by end 2008 and triple capacity to 2042mmcf/d by 2009. If successful, the supply plan will enable gas-fired generating capacity to grow to 4651MW within 12 months and further grow to 6158MW by end of 2009. It will also triple the gas supply to domestic industries from 179mmcf/d to 435mmcf/d by end 2009[10].

Gas Infrastructure Development Plans

As part of the broader policy initiative, the Nigerian Infrastructure Blue Print was also developed. The highlights of the proposal are as follows:

- Proposed structure planned for significant increase in capacity to 5bcf/d with scope for rapid expansion.
- Extends infrastructure to Katsina with future plans to other areas in the north.
- Significant increase in network to meet demand growth in South East.
- Open linkages between East, West and North.
- Allows for all the IOCs to align their infrastructure with the national grid.
- Harmonizes gas infrastructure into one national grid, which is critical for flexibility of supply.
- Minimizes concentration of infrastructure in one region. Primarily allows for processing of natural gas, removal of LPG and condensates for export.

Source NNPC

Future investments in gas development could be affected by concerns relating to security, securitization package, and gas price. While the latest package of measures announced signals the Government's urgency and interest in resolving the critical gas issues, a number of concerns have been raised by stake holders. In particular, the concerns regarding the security situation and the not yet agreed securitization packages for gas supply to the power sector, the main customer in Nigeria, could inhibit investors[11]. Gas producers demand payment security apart from what they perceive as adequate prices to commit investments in gas supply to power plants, or in the case of Joint Venture power generation plants supplying their own gas, for the sale of electricity. It is also a concern whether the new gas pricing policy will be sufficient incentive for operators to develop non-associated gas reserves.

Conclusion

Even though Nigeria is abundantly rich in energy resources, it is clear that unless appropriate pricing is adopted both for electricity and gas, its energy sector growth will not be sustainable. However, these pricing measures will not yield the desired results unless complementary governance measures are adopted to make them sustainable.

Now that the MYTO principle has been accepted, NERC should give consideration to some possible refinements. For example, in most countries (e.g., Peru, Brazil, Romania and Pakistan) where the MYTO approach has been implemented, the norm is for MYTO prices to be calculated on an enterprise by enterprise basis to take account of significant differences in customer mix, overall load profiles, and the physical characteristics of different service territories. A uniform national tariff, which is taken as a given in NERC's current MYTO proposal, is neither sustainable nor desirable over the long term[12]. Various stakeholders have been consulted on the approach of MYTO, but the underlying assumptions and the financial model need to be tested in public domain. NERC would benefit from making having key sector stakeholders take a close look at both the assumptions and calculations underlying the MYTO model[13]. A workable subsidy mechanism needs to be designed and agreed in the short-term, and certain basic implementation questions have to be addressed. Specifically, further clarity is needed about the recipient entities of the subsidy, the periodicity of these transfers, the day-to-day administration of the transfers, and so on[14].

Regular monitoring of gas supply and enforcement of domestic gas supply obligation can improve

gas supply in particular to power plants. It is necessary to implement the necessary institutional and contractual arrangements to make this obligation work and establish the necessary infrastructure. The Downstream Gas Law needs be finalized to create a legal and regulatory framework for private investments in gas pipelines and modify/reduce role of the Nigeria Gas Company, which is the state owned company entrusted with building and maintaining gas transmission infrastructure. The law is meant to abolish the Nigerian Gas Company or privatize it and thus reduce its role as a de facto monopoly for gas pipelines and allow others to build them to introduce competition, efficiency and reliability in gas transmission infrastructure.

Footnotes

[1] This paper, however, is not intended for a discussion on the oil sector.

[2] Gnansounou, 2008

[3] Tallapragada and Adebusuyi, 2007.

[4] PHCN: The public sector power Holding Corporation of Nigeria- the state power utility after the new reform legislation has been passed

[5] NIPP: The National Integrated Power Project- a major publicly funded government power infrastructure program

[6] The number of customer connections (registered customer population) is reported to be 4.50 million out of which the number of metered customers at 3.04 million (source: Corporate Performance Management department of Power Holding Company of Nigeria). Based on these figures, more than 30% customers are currently un-metered. However, the actual number of customer connections was hard to obtain as the data on customer connections are no longer recorded and monitored centrally. There exists conflicting numbers with regard to customer connections raising doubts about the accuracy of the number.

[7] Sachdeva and Goswami, 2008

[8] Will translate roughly into US $ 550 million in the first year as per current exchange rates

[9] Several studies point this out including one conducted by Shell through it's Nigerian subsidiary SPDC

[10] Svensson, 2008

[11] Goddard, 2007

[12] Tenenbaum, 2007

[13] Tenenbaum, 2007

[14] Goddard, 2008

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