

Power sector reforms in Nigeria: opportunities and challenges

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Abstract

Constant power supply is the hallmark of a developed economy. Any nation whose energy need is epileptic in supply, prolongs her development and risks losing potential investors. Nigeria, a country of over 120 million people, has for the past 33 years of establishment of the National Electric Power Authority (NEPA) agency empowered with the electricity generation, transmission and distribution, witnessed frequent and persistent outages. Presently, the federal government has embarked on power sector reforms with the intention of improving the above unpalatable scenario and in turn reduce the scope of monopoly control of the nation's power industry. This paper therefore looks at the overall power sector reforms as well as evaluates the opportunities and challenges there from; while advocating introduction of a demand side management (DSM) program by Power Holding Company of Nigeria (PHCN) as a way of reducing energy consumption among customers with emphasis on energy conservation, energy efficiency and load management.

Keywords: power sector, energy sources, privatisation, conventional energy, demand-side management

1. Introduction

The history of electricity production in Nigeria dates back to 1896 when electricity was first produced in Lagos, fifteen years after its introduction in England (Niger Power Review, 1985). The total capacity of the generators used then was 60KW. In other words, the maximum demand in 1896 was less than 60 kW. In 1946, the Nigerian government

electricity undertaking was established under the jurisdiction of the public works department (PWD) to take over the responsibility of electricity supply in Lagos State.

In 1950, a central body was established by the legislative council which transferred electricity supply and development to the care of the central body known as the Electricity Corporation of Nigeria (ECN). Other bodies like Native Authorities and the Nigerian Electricity Supply Company (NESCO) had licenses to produce electricity in some locations in Nigeria.

There was another body known as the Niger Dams Authority (NDA), which was established by an act of parliament. The Authority was responsible for the construction and maintenance of dams and other works on the River Niger and elsewhere, generating electricity by means of water power, improving navigation and promoting fish brines and irrigation (Manafa, 1995). The electricity produced by NDA was sold to ECN for distribution and sales at utility voltages.

In April 1972, the operation of ECN and NDA were merged in a new organization known as the National Electric Power Authority (NEPA). Since ECN was mainly responsible for distribution and sales and the NDA created to build and run generating stations and transmission lines, the primary reasons for merging the organizations were (Niger Power Review, 1989):

- It would result in the vesting of the production and the distribution of electricity power supply throughout the country in one organization which would assume responsibility for the financial obligations.
- The integration of the ECN and NDA should result in the more effective utilization of the human, financial and other resources available to the electricity supply industry throughout the country.

Since inception of NEPA, the authority expands annually in order to meet the ever-increasing demand. Unfortunately, the majority of Nigerians have no access to electricity and the supply to those provided is not regular (Okoro & Madueme, 2004). It is this backdrop that the federal government has embarked on aggressive power sector reforms with the intention of resuscitating NEPA and making it more efficient, effective and responsive to the yawning of the teeming populace.

This paper looks at the challenges and opportunities such reforms pose on NEPA as a utility company in particular and the nation in general.

2. Energy sources in Nigeria

Electricity production in Nigeria over the last 40 years has varied from gas-fired, oil-fired, hydroelectric power stations to coal-fired stations with hydroelectric power systems and gas-fired systems taking precedence. This is predicated by the fact that the primary fuel sources (coal, oil, water, gas) for these power stations are readily available.

Nigeria's coal reserves are large and estimated at 2 billion metric tonnes of which 650 million Tonnes are proven reserves.

About 95% of the Nigerian coal product has been consumed locally, mainly for railway transportation, electricity production and industrial heating in cement production.

Nigeria has abundant reserves of natural gas. In energy terms, the quantity of natural gas is at least twice as much as the oil, and the horizon for the availability of natural gas is definitely longer than that of oil. The known reserves of natural gas have been estimated at about 2.4×10^{12} cubic metres and are expected to last for more than a century as a domestic fuel and a major export (Bustros, 1983).

The third major sources of energy, oil is Nigeria's major sources of revenue used for development. As at January 2005, Nigeria's proven crude oil reserve stands at 35.2 billion barrels. The Nigerian government plans to expand its proven reserve to 40 billion barrels by 2010. The majority of reserves are found along the country's coastal Niger Delta.

Some of the favourable factors affecting the export prospect include relatively low production costs, ease of oil recovery, good relations with equity producers and the relative proximity of major markets (Ekwue, 1989).

3. Power sector reforms

At present, the installed and available electrical capacity in the Nigerian generating stations are shown in Table 1. Table 1 shows that despite a total grid capacity of 5924.7 MW, only 4586 MW were available. Thus 22% of the installed capacity was unavailable. This may be due to operational inadequacies and inability of units to operate at full

capacities of the generating stations and their respective percentage contributions to the total energy products.

Table 1: Generating plants – grid stations
Source: Okoro & Madueme, 2004

Site	Type	Installed capacity (MW)	Available capacity (MW)	No. of units
Afam	Thermal	700	488	18
Delta	Thermal	812	540	20
Egbin	Thermal	1320	1100	6
Ijora	Thermal	66.7	40	3
Sapele	Thermal	1020	790	10
Jebba	Hydro	540	450	6
Kainji	Hydro	760	560	12
Shiroro	Hydro	600	600	6
Orji River*	Thermal	60	-	4
Others	Diesel	46	18	-

* Operational inactive

The call for power sector reform in Nigeria is primarily as a result of inadequate electricity supply, incessant power outages, low generating plant availability and high technical and non-technical losses that have characterized the Nigerian electricity industry. The federal government in 2000 adopted a holistic approach of restructuring the power sector and privatising of business units unbundled from NEPA (Oyeneye, 2004). By this development, NEPA will be unbundled into seven generation companies (GenCos), one transmission company (TransysCo) and eleven distribution companies (DisCos). This arrangement is expected to encourage private sector investment particularly in generation and distribution. This will definitely break NEPA monopoly and pave way for the entry of independent power producers (IPPs). The structure has since come into effect in January 2004 into what is called the Power Holding Company of Nigeria, PHCN. This structure is to be test-run for two years with a down-pruned management team at the headquarters while the individual managers of the unbundled segments are expected to enjoy some level of autonomy (Okafor, 2005). In the new arrangement, TransysCo will be government-owned and managed by system operators, (SO) and transmission operators, TO. The reform bill, approved by the federal executive council (FEC) is intended to achieve five objectives:

- Unbundle NEPA
- Privatisise the unbundled entities
- Establish a regulatory agency
- Establish a rural electrification agency and fund
- Establish a power consumer assistance fund.

Other key components of the electric power sector reform bill include:

- Powers of the Nigerian Electricity Regulatory Commission (NERC) to regulate tariffs and quality service and powers to oversee the industry effectively.
- Powers of NERC in relation to anti competitive behaviour, including mergers and acquisitions licensed electricity companies.
- Institutional and enforcement requirement of the regulatory regime.
- Requirement for licensing by the NERC of the Generation companies system operator, transmission services, distribution companies and trading companies that will be created from the restructuring and unbundled of NEPA.
- Legislative authority to include special conditions in licenses.
- Provision relating to public policy interest in relation to fuel supply environmental laws, energy conservation, management of scarce natural resources, promotion of efficient energy, promotion of renewable energy and publication of reports and statistics.
- Providing a legal basis with necessary enabling provisions for establishing, changing, enforcing, and regulating technical rules, market rules and standards.

In November 2005, the Nigerian Electricity Regulatory Commission (NERC) was inaugurated and charged with the responsibility of tariffs regulation and monitoring of the quality of services of the PHCN.

4. Challenges and opportunities

4.1 Challenges

Power sector reforms in a developing economy such as Nigeria pose great challenges not only to the government that initiated the programme but also to the populace who are the consumer of energy and to the new born PHCN, which parades itself as a better alternative to the moribund NEPA. These challenges can be broadly classified into four areas:

- Economic and social
- Technical
- Political and
- Environmental

4.1.1 Economic and social

It is no longer debatable that the primary aim of the power sector reform by the federal government is to enhance the efficiency of the nation's power industry as well as make energy affordable and available to consumers. This means generating more power to the national grid and re-activating most of the 'dead' units in the nation's power stations.

In order to satisfy the demand of electricity by consumers, new power stations must be constructed by the federal government, the PHCN and the independent power producers (IPPs). Construction

of new power stations and comprehensive maintenance of dysfunctional existing units are usually capital intensive. There is always a price to pay for constant power supply in our homes. This will definitely translate to more money being given out to the utility companies by end users since the former primary concern will be to make profit. This is evident from the research conducted by Hall (2000) regarding a privatisation programme in Hungary and the United Kingdom.

4.1.2 Technical

It is not just enough to generate power adequately without recourse to the strength of the existing transmission line capabilities as well as how the power could be used for the overall interest of both the PHCN and the consumers. The former emphasise the need for transmission lines and substation re-enforcement and construction of additional transmission lines in order to ease evacuation of energy especially in areas where the IPPs cluster as result of proximity to energy sources (Inugonum, 2005). The latter calls for establishment of the demand side management (DSM) program by the PHCN. Demand-side management programs usually consist of the planning, implementing, and monitoring activities of electric utilities that are designed to encourage consumers to modify their level and pattern of electricity usage. Instead of building new power plants to respond to increasing customer demand, electricity producers can also endeavour to minimize their customer's demand for power by offering special programs for homeowners, businesses, institutions and industry. To determine the success of such programs, the costs and benefits of DSM opportunities should be directly compared with the costs and benefits of building new power plants and transmission lines (Donald).

4.1.3 Political issues

There is a need of creating and ensuring level playing fields for all stakeholders in the emerging power sector reform if the desired objectives are to be achieved. By the reform programme, it is expected that the power sector will open itself to key players within and outside the country. This means that the IPPs should expect a conducive political atmosphere before they can agree to invest their money. The majority of the IPPs would like to construct their plants within the Niger Delta area where sources of energy needed to run their plants are guaranteed. At present the hostile environment in the Niger Delta predicated by armed ethnic militia and youth restiveness will definitely scare intending power investors. This brings to fore the need to sustain the nation's democratic structures with the view of ensuring government policy stability. By so doing, the envisaged comprehensive national energy policy that will take care of conservation, stor-

age, consumption, construction and distribution will be sustained when it becomes operational.

4.1.4 Environmental factors

The nature of power plants to be built in a given locality is dependent on the nature of the environment. For instance, a city which already has a cement industry and chemical industry may frown at hosting thermal power plants because of a high level of Carbon monoxide (CO) emissions. In order to guard against this scenario, the government must create the Environmental Inspection Agency (EIA) to monitor and regulate the extent of damage caused by pollution to the environment and the inhabitants. Again, the IPPs may be confronted by high compensation fees, and right of ways in their quest to erect a power plant in any given city. These high compensation fees may run into millions and can invariably pose as a deterrent to potential IPPs.

4.2 Opportunities

The last section has enumerated the enormous challenges involved in government power sector reforms. Here, the opportunities derivable from such laudable steps in terms of efficiency and reliability of services, investment opportunities, employment opportunities, transfer of technical manpower and encouragement of research will be discussed.

4.2.1 Efficiency and reliability of services

Proper implementation of the reform programme will promote efficiency and growth in the power sector. The reform will lead to improved electricity services as it will encourage private sector participation and investment in the electricity industry. The evidence can be seen in the form of better telecommunication services in the country brought about by private sector participation in the provision of GSM services (NEPA, 2004).

4.2.2 Investment opportunities

Power sector reform has the ability to massively expand personal share ownership in Nigeria. It is believed that over 800 000 shareholders can be created after privatisation of NEPA. This is a welcome development which enables capital formation and economic growth (Wikipedia, 2004). It can reduce the reliance of public enterprises on the government for finance. Unbundling of NEPA will make the successive companies easily raise funds through the capital market once the necessary investor confidence has been developed; thus changing their growth and expansion of their business outfit. Also, new power facilities by the private sector will provide new capital injection into the economy. The Federal government power sector reform will create an enabling environment for investment and a healthy co-operative industrial outfit. Indeed, what is currently happening in the communication sector

is clear-cut evidence of what privatisation can do. Before now, Nigerians have been suffering from continued exploitation by the Nigerian Telecommunication Limited (NITEL) as a result of monopoly. But since the privatisation of the Telecommunication sector which gave birth to the influx of privately owned telecommunication companies like MTN, ECONET (V-Mobile), GlobalCom, RELTEL, RAINBONNET etc, the prices of servicing a telecommunication line has reduced drastically, as a result of competition among these companies (Ige, 2004). In the same vein, a well structured and judiciously implemented NEPA privatisation will bring about investment opportunities which will invariably attract both local and international Independent Power Producers (IPPs).

4.2.3 Employment opportunities

The power sector reform will in the long run create reasonable employment opportunities for Nigerians. This is because the companies that are expected to participate will look for both skilled and unskilled labour in the task of executing their businesses (Benbow, 2003). It is expected that when the reform is fully implemented, many graduate engineers and technologists roaming the streets in search of unavailable jobs, will finally heave a sign of relief as most of them will be absorbed by the emerging independent power producers.

4.2.4 Transfer of technical manpower

Subsidiary companies that will compete in the power sector, which some of them must be foreign companies, have to come with their expatriates. These companies in a bid to set up their operational structure will impact knowledge and skill in areas of demand side management, power system protection and planning, voltage collapse and stability, co-generation, etc to Nigerians through their foreign expatriates. This area of technology transfer, if well tapped by Nigerians, will go along way in breaching the gap between the developed and developing nations in terms of technology advancement.

4.2.5 Encouragement of research

Privatisation brings about competition and allows management of privatised companies full freedom to realize their optimum potentials. In order for any company to take a lead over the other, its products must be second to none. Such excellence in quality of products could only be achieved through research. With emerging power sector reform, other sources of renewable energy such as wind, solar and biomass are expected to be explored. For instance in the UK, prior to privatisation of the electricity sector, coal and gas turbines were widely used. With privatisation, research was conducted in combined heat and power plants. With the eventual success in research, generation companies rose

from 10 to 32 while supply companies rose from 16 to 34 in 1990 because of new innovations in the field (Wikipedia, 2004). Definitely, the new owners of the privatised NEPA will embark on research, motivated by a different set of imperatives as new rules, more professional standards, new performance criteria and better training emerge.

5. Benefits

The power sector reforms in Nigeria will bring about the same competition in the sector as being witnessed in the Telecommunication sector, which in turn, will positively affect the masses in the following areas:

5.1 Increase in employment

When a good number of electricity companies crop-up, invariably they will need human labour to operate and maintain the companies, which means creation of employment opportunities for the vast majority of Nigerians that are jobless.

5.2 Reduction in crime rate

Currently, most of the Niger Delta areas – which produce the Nation's crude oil, have become war-torn zones and unsafe for business. The Youths engage themselves in one form of unlawful behaviours ranging from pipeline vandalization to kidnapping of both local and international oil workers. If greater numbers of these restive youths are gainfully employed and receive a substantial amount of money at the end of every month, the crime rate will definitely be reduced if not eliminated completely.

5.3 Improved services

One of the major reasons why the services of NEPA have remained poor is essentially because of monopoly. The company has been the sole producer and distributor of electricity to the entire nation. This means that consumers of electricity are left to the mercy of the utility company – whose efficiency over the past 35 years of its existence is nothing to write home about. About 60% of Nigerians cannot afford a generating set as alternative means of power supply. Therefore, the power sector reform programme which must give rise to competition in the market will definitely result in improving services because every IPP will strive to improve its services in order that consumers will be willing to patronize it. There will also be greater responsiveness to consumer needs.

5.4 Reduced tariffs

Privatisation of the power industry can allow the management of privatised enterprises full freedom to realize their optimum potential. This has led to more productive employment and economic growth (Akpan, 2002). Therefore, an electricity

industry would become more cost-effective when it is opened up to competition and accountable to market criteria (Obadan, 2003; Ayo, 2002). A competitive electricity market is therefore capable of bringing about reduction in the tariff paid by consumers. In as much as every consumer needs efficient and effective services, it must be at an affordable rate. Consequently, with many IPPs in place, the strategy of tariff reduction to a level that is quite affordable to everyone will be a re-occurring phenomenon among competing companies.

6. Conclusion and recommendations

This paper has highlighted the on-going federal government of Nigeria power sector reform programme. The challenges as well as the opportunities inherent in such a reform programme have been discussed. It is envisaged that the reform programme will usher in a competitive energy market, break the monopoly enjoyed by NEPA and increase the rate of technology development as well as provide jobs for both technical and non-technical graduates.

However, for the programme to bring about the above positive changes, the following recommendations should not be glossed over:

1. Government should ensure level playing fields for the independent power producers and other genuine investors in the power business.
2. Members of the Nigerian Electricity Regulatory Commission should be effective, efficient, unbiased in its role and corruption-free, while the body itself should be truly independent.
3. Consumers of energy should be provided with a good education on the most efficient use of energy.
4. Pricing schemes to promote load management should be encouraged. Demand-driven pricing provides customers with an incentive to minimize their energy consumption during peak periods.
5. The old-time 'Estimated billing method' should be discouraged. An accurate billing system should be introduced while rebates or subsidies introduced by energy companies as a way of supporting DSM improvements.
6. Nigerian engineers should be adequately represented in the planning and implementation of all aspects of the power sector reform programme.
7. The consumers of energy must come to terms with the fact that the rules have changed. They must be ready to pay for any amount of energy consumed since the utility companies are purely driven to make profit as well as to render good services.
8. Under the new reform scheme, the NERC should map out a suitable policy in terms of pricing the electricity that is purchased in the form of a long term Power Purchasing Agreement (PPA).

References

- Akpan, I.: Independent Power Producers and Power Sector Reforms, The Guide, January 2002, pp.12-16.
- Ayo, D.A.: NEPA Efficiency through Privatisation', *The Pioneer*, 15th July, 2002, pp.15-19.
- Benbow, A.: West Australia Electricity Reform Privatisation Disguised, *Green Left Weekly*, October 2003, pp.1-16.
- Bustros, A.O.: Petroleum in Nigeria, Oxford University Press, Ibadan, 1983, pp.3-6.
- Donald, C.: U.S. Electric Utility Demand-Side Management: Trends and Analysis, www.eia.doe.gov/cneaf/pubs_html/feat_dsm/contents.html, 1997, pp.1-26.
- Ekwue, A.: Energy supply in Nigeria, *IEE Review*, September 1989, pp. 301-306.
- Hall, David: Impact of Electricity Privatisation on Industrial Relation: Lessons from UK and Hungary, www.psir.org, November 2000.
- Ige, O.: Deregulation of the Power and Telecommunications Industry and Market operations reform in Nigeria, Proc. 20th National Conference of the Nigerian Society of Engineers (Electrical Division), October 6-7, 2004, pp. 1-4.
- Inugonum, T.: Challenges Facing the Development of Independent Power Producers in a Deregulated Power Sector in Nigeria (NEPA as a case study), 6th International Conference on Power System Operation and Planning (ICPSOP), May 22-26, Cape Verde, 2005, pp. 33-37.
- Manafa, N.: Electricity Development in Nigeria, Rasheen Publisher, Lagos, 1995, pp.37-51.
- NEPA Profile, www.nepanigeria.org. 2004.
- Niger Power Review: Development of the Electricity Industry in Nigeria (1960-1985) , 1985, pp. 1-6.
- Niger Power Review: Development of the Electricity Industry in Nigeria (1960-1989), 1989, pp. 10-15.
- Obadan, M.I.: Privatisation and Public Enterprises in Nigeria: Issues and conditions for success in the second round, *The Punch*, 30th July, 2003, pp.56-57.
- Okafor, F.N.: Modelling the Ancillary Services in Deregulated Power Networks of Developing Economics, 6th International Conference on Power System Operation and Planning (ICPSOP), May 22-26, Cape Verde, 2005, pp. 222-227.
- Okoro, O. I. and Madueme, T.C.: Solar Energy Investments in a Developing Economy, *Renewable Energy*, Vol. 29, 2004, pp. 1599 -1610.
- Oyeneke, O.O: Socio-economic Influences on Policies of Power Deregulation, Proc. 20th National Conference of the Nigerian Society of Engineers (Electrical Division), October 6-7, 2004, pp. 1-15.
- Privatisation, www.wikipedia.org. 2004.

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