Independent Power Producer (IPP) Participation: Solution to Nigeria Power Generation Problem

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Abstract—**Nigeria is locked up in an energy poverty cycle since the 80's when the nation neglected signals to improve upon its power generation capacity. The poverty of energy in Africa is raising concern despite her huge resources ranging from Oil/Gas to renewable resources. This work evaluates the independent power producer participation in the Nigeria power sector and the role the government need to play to attract investment. Capacity building measures were suggested to help facilitate the involvement of the IPP firms to end the power crises in the country. This work also reviews the Nigeria power sector and the challenges it faces over a long period of time. This work will serve as a guideline to government and politician charged with responsibility to reform the power sector in Nigeria.**

Keywords– IPP; power generation ;energy poverty; Nigeria; electricity,power reform

I. INTRODUCTION

There is no doubt that Africa is locked in a cycle of energy poverty. Africa, the world's second-largest continent with about 13% of the world population, is the poorest in terms of energy utilization. Its total energy consumption is less than 3% of global primary energy demand despite its huge potential to generate energy. Electricity, a necessarily ingredient in modern civilization, is yet to adequately penetrate Africa countries especially the rural areas. The continent's electricity sector is lagging far behind in world standards, particularly in West Africa States like Nigeria. It is very obvious that Africa's energy poverty is not a matter of want of resources because the Africa countries are endowed with huge resources. About 7% of world oil and gas reserves are locked up in Africa, coupled with 6% of coal reserves not to mention considerable potential for renewable energy. Countries like Nigeria, Angola are strategic members of OPEC due to oil exploration from these countries. Nigeria gas flare is second only to Russia indicating the extent of resources to allow waste. Most African countries still generate Electricity from traditional methods like the use of cola plants (South Africa) and extensive reliance on hydro-electric (Nigeria) and oil- and gas-fired plants [1-3]. The rise in demand of electricity due to population growth and emerging industrialization in Africa is a factor contributing to the power outages coupled with the insufficient generating capacity that laced the countries power producing sector. Technological limitation also affects the efficient utilization of the Hydroelectric potential in most Countries. The 1,888 TWh/y in Hydroelectric that could be exploited is challenged with huge technical gaps when compare with what is obtainable else where. Africa barely use 5% (87 TWh) when compared with 20% in South America, over 40% in Central and North America and over 57% in Europe. Africa Electricity supplies have always been through government agencies that are charged with the responsibilities of power generation, distribution, control and maintenance of generating and distribution equipments. These agencies have failed in numbers of cases to meet the rising demand, despite government claims of rebranding. However, this imbalance offers cooperative opportunities for sustainable energy integration through the participation of independent power producer (IPP) in most Africa counties especially in Nigeria. The recent steps by Nigeria government to reform the Power sector will only become significant if the IPP participation is well structured and there are incentives to attract foreign investment and participation.

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II. THE NIGERIA POWER SECTOR

The history of electricity in Nigeria dated back to 1898 when two small generating sets were installed to serve the then Colony of Lagos, only fifteen year after its introduction in England [4]. Pattern of electricity development was in the form of individual electricity power undertaking scattered all over the towns until 1950. By an Act of Parliament in 1951, the Electricity Corporation of Nigeria (ECN) was established, and in 1962, the Niger Dams Authority (NDA) was also established for the development of Hydro Electric Power. However, a merger of the two was made in 1972 to form the National Electric Power Authority (NEPA), which as a result of the Electric Power Sector Reform Act of 2005, was transformed to Power Holding Company of Nigeria (PHCN). Since 1972 NEPA is the only one that generate and distribute electricity in Nigeria without any competition which make the agency relax and depend solely on government for its financial need. The need to properly earnest its resources and improve its facility to meet future demand was ignore. NEPA's inability to projects development and industrialization was first the Nigerian electricity problem which was compounded with NEPA poor maintenance of the electricity generation/distribution facilities. NEPA has high energy losses (30 - 35 % from generation to billing), a low collection rate (75 - 80 %) and low access to electricity by the population (36 %). There is insufficient cash generation because of these inefficiencies and NEPA is consequently reliant on fuel subsidies and funding of capital projects by the government. The government in an effort to revitalize the sector changes the name NEPA to Power

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Holding Company of Nigeria (PHCN) but there were no significant output to justify the government investment. The Nigerian government between 1999-2007 invested between $3-1$6 billion to rescue the dying sector but all to no fruition.

TABLE 1
EXISTING AND PLANNED ELECTRICITY PLANTS IN NIGERIA, 2005[5]

Existing plants		
Type	Capacity (MW)	Year Commissioned
Jebba Hydro	578.4	1984
Kainji Hydro	320	1968
Kainji Hydro	200	1976
Kainji Hydro	240	1978
Shiroro Hydro	600	1990
Afam I Gas	20.6	1963
Afam II Gas	35	1965
Afam III Gas	95.6	1976
Afam IV Gas	110	1978
Afam v Gas	450	1982
Ijora Oil	6.7	1966
Ijora Gas	60	1978
Delta I Gas	72	1966
Delta II Gas	120	1975
Delta III Gas	120	1978
Delta IV Gas	600	1990
Sapale GT Gas	300	1981
Sapele St Gas	720	1978&1980
Oji Coal	300	1956
Egbin Gas	1320	1985
Egbin IPP Gas	270	2004
TOTAL	**6,538.5**	
Planned plants		
Type	Capacity (MW)	Year Commissioned
Papalanto Gas	330	Since 2007
Omotosho Gas	330	Since 2007
Guregu Gas	414	Since 2007
Alaoji Gas	330	Since 2007
IPP Gas	3906	-
IPP Gas	2584	-
TOTAL	**7897**	

The nation has an installed capacity of approximated 6538.3 MW as shown in Table 1. Out of the approximated 6538.3MW of installed capacity in Nigeria, not more than 4500 MW is ever produced. On the transmission scale,the transmission system comprises of 33KV lines and 132KV lines, a mixture of radial and ringed types, which transport electric energy from generating power stations to major grid substations from where 33KV and 11KV distribution network are supplied. There are over 114 major grid substations in the country; 23 of which are linked by 5000km of 330KV lines and 91 are linked by 6000km of 132KV lines, while on the distribution network there are hundreds of kilometers of 33KV and 11KV lines connected to various distribution substations all over the country. There are also over 1790 distribution transformers and 680 injection substations [6].

III. NEED TO FACILITATE INDEPENDENT POWER PRODUCER (IPP) PARTICIPATION IN NIGERIA POWER SECTOR

In the bid to improve the electricity generation and distribution in Nigeria the government had finally succumb to the pressure of involving IPP participation in the power sector after years of gross inefficiency that characterized the PHCN. The recently launched Roadmap for Power Sector Reform by the incumbent president is to fast-track the implementation of the Electric Power Sector Reform (EPSR) Act which allows private sector initiatives in the power industry. This will be the end of decades of unproductive investment in PHCN. The PHCN have been accused of gross misappropriation of fund and technical incapacities to handle the nation electricity but because its parade itself as government instrument birthed by the law it was difficult until now to relief her of her duties. The Power Sector over the years has been in a deplorable state mainly due to inadequate maintenance of equipment, poor funding and inadequate infrastructural development. For over ten years prior to 1999, the Sector did not witness substantial investments in infrastructure development and development of new generation plants. The involvement of IPP will create efficient, transparent and goal-driven institutions that can achieve the desire performance expected from a power industry as obtainable in developed countries. Mobilizing the private sector investment and managerial competence in the power sector will transform Nigeria's electric power sector into a dynamic industry that can meet the demand of long-frustrated Nigerians, create jobs and boost economic growth. In other to attract private sector investment and create a sustainable power sector, the Federal Government will need to structure its reform in power sector reforms towards:

- Provide an environment that will allow competition among utility provider and to facilitate more rapid provision of services throughout the country;
- Create a new and regulatory environment that will allow a level playing field for all the player,
- encourage private investment and expertise through incentives and benefits at the early stage to make the market competitive,
- Not to restructure the IPP around PHCN; and
- Enforces adherence to international regulation on power generation and distributions.

The recent government initiative to attract private sector investment and management into the sector by inviting experienced power sector companies to take up 51 per cent of shares in the PHCN's 6 Generation and 11 Distribution Successor Companies is seen as a positive step but government commitment in the project still make it vulnerable and unattractive to the public. The needed independent power producer participation will require the government to give up power production but to take on the role of monitoring and regulation of price, quality and environment through concerns through its agencies. According to Nigerian Electricity Regulatory Commission (NERCN) an average of about $5.3 billion is spent on fuel to generate electric power every year meaning that Nigerians will be willing to pay for the electricity so long is available. Table 1 shows the installed capacity of generation plants in Nigeria with proposed plants by IPP companies. It will be observed that the IPP propose to building plants within a year that will double the capacity since 1956. The

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Nigeria electricity problem will be a forgotten issue if the IPP participation comes into effect because the financial investment is to be sort outside government resources.

IV. IPP Participation: Conditions & Roles

The Presidential Retreat for IPP and financial investors in Power which was held between 14th -15th of October 2010 had in attendance investors and lenders such as Goldman Sachs, Siemens AG, Royce Rolls, JP Morgan, Suzlon Energy. The meeting prompt Essar to commit an investing of about $ 2 billion dollars in Nigeria's power sector, also investors under the auspices of the Commonwealth Business Council also expressed an interest in investing of $20 billon. This huge investment interest will only be substantiated if the investor can be guaranty safety of the investment. A right step in that direction is for the government to work towards securing the World Bank Partial Risk Guarantee and a Federal Ministry of Finance Risk Guarantee to compensate against political and other risks that make emanate due to the participation. If this deal with the World Bank is not finalized the hope of IPP participation will not be guaranty and many of these investors may back out, since the Nigeria government cannot be trusted. The first objective of the IPP participation will be to ensure complete corporatizations of the electric power industry to enable it acquire integrity and trust lost by the PHCN. The second objective will be to generate surplus electricity to offset the growing demand, as well as achieve cost competitiveness and increased customer focus. This implies complete separation of the utility enterprise from government agencies, the adoption of a private rights status and recognition of greater autonomy for the company [7,8]. The IPP participation will eliminate the financial challenges faced by PHCN as it is expected to sort its the needed financial investment to raise the capital for rehabilitation of obsolete facilities and acquisition of modern equipments to efficiently generate and supply power to its customers. It is expedient that for sustaining a solvent cash flow the IPP Company will need to increase its tariff collection rate and minimize losses from ghost-consumers which can be done with cooperation with the government organs. On the technical side there is need for the transmission network to be expanded using the state of art equipments so that all power plants generation capacity can be optimized.

V. Current Challenges Facing Power Reform & IPP Participation In Nigeria

The integration of power reform with the current systems will require cooperation both from the government, the IPP firms and the Citizens. A few of the problems faced by many Electricity Reform programs in Nigeria includes:

1. Harmonization of legal and regulatory frameworks to prevent government regulation becoming an obstacle to power reforms; especially since African countries lack continuity of program after successive government

2. Achieving cost reflective tariffs for electricity and gas. One major fear of the populace is that the billing of electricity will be outrageous if the private investors take over the industry. Also, the private investors need guaranty that the government will be able to meet target of gas for those planning gas plants. The PHCN over the year have attributed there poor performance to inconsistency in gas supply to power some of its gas plants. This is raising a concern among investor that want to take the advantage of huge gas resources in Nigeria to deliver a cost effective investment.

3. The need for an environment that encourage investment. The current tension in the Gas/Oil regions of Nigeria is a factor that will influence investment. Investors will like to have respect for property rights, good governance and the rule of law and political stability.

4. Capital inflows and Finances: The bulk of the finance to kick – start most of the power plant projects are expected to come from abroad but there is no doubt that the Nigeria banks need to be position to offer assistant when needed. Its seems that the current reform in the banking industries need to be fast track to position the financial institution to contribute to the power reform.

5. Payment Security: There are still concerns raised by foreign power developers that Payment Security has to be confirmed as real function scheme. In the event of default by distribution agencies, IPP developers have less power to resume tariff recovery mechanism.

VI. Capacity Building

There is need for capacity building to properly integrate the propose power reform by the government. There will be need in man power, research and electricity conservation awareness.

1. The Power sector: There is a serious shortage of competent personnel in the power sector. The shortage of technical staff is evidence due to lack of consistence training coupled with lack/misappropriation of budget for the sector. The remuneration of the staff is one of the highest in the country but when compared with other countries its poor. The government needs to invest in Training (Operation, Planning, and Research) and to mandate the IPP firms to do same.

2. Maintenance Management: There is gross mismanagement in the present PHCN when it comes to Maintenance and repairs. Most of the plants under the supervision of the PHCN are in bad shape due to poor maintenance practice.

3. The Tertiary Institutions: The Nigeria tertiary institutions are not equipped to adequately carter for the power industries. The University Curriculum for the Engineering courses should require compulsory courses ranging from technical to managerial aspect of power systems. The current curriculums for concerned engineering program lack the needed reflection in the power industry. There is also need to concentrate research focus on renewable sources that can be use for electricity generation in the Universities.

4. There is need for government to seek assistant from foreign government/partner to develop potential areas of expertise in the following:

- Demand side management consisting of Electric power demand and load forecast
- Development of Renewable sources of Electricity such as solar, Photovoltaic cells systems and wind driven plants etc
- Extensive Analysis of economics of Electricity market and Power systems

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- Simulation studies of the distribution network and the grid system to identify optimal number of distribution zones that can be created along state boundaries.
- Transmission and Distribution Systems Protection.
- Local fabrication and testing of electrical components, materials & systems (CFL, meters, insulators, inverters, solar panels, etc)

VII. Conclusion

The need for IPP participation is necessarily if Nigeria is to break the energy poverty cycle, the government organs charged with the responsibilities of generating and distributing electricity have failed and the only needed reform is to give the private sector the opportunity of investment which will translate into an economic growth. The government is laced with responsibility to see the reform through and to guaranty the involvement of private investment through incentives and policies that will effectively integrate IPP in the energy sector.

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