

ENERGY MANAGEMENT AS A WAY OUT OF NIGERIA'S ENERGY POVERTY

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The effective and efficient use of energy resources remain a key factor to the industrialization of any country for its developmental purposes. With a population of over 140 million and a meager generation capacity of 3,800MW, Nigeria still expend 79% of its energy on the residential sector while just 12% is used by the industrial sector which actually is the sector driving the economy. With Government's focus turning towards economic transformation, there is need for re-appraisal of the country's energy sector, with focus on the management of its abundant, yet untapped, energy resources so as to move the country towards the achievement of the Millennium Development Goal (MDG). This paper examines Nigeria's energy poverty vis-à-vis its industrial development drive, and concludes that for Nigeria to achieve its vision 20:2020 it must incorporate the culture of energy management, by instituting ECE policies, as it not only provides the necessary energy needed to achieve it, but it will also save cost of energy both on the part of the government and citizenry.

Keywords: energy management, electricity, energy efficiency and conservation, energy resources.

INTRODUCTION

Nigeria without doubt is faced with a vast energy challenge despite the abundance of energy resources, including manpower to convert those resources into finished energy for the country, the problem of inadequate energy still persist.

It is observed that Nigeria's per capita electricity consumption is very low compared to other African countries. At electricity generation of about 20W per person (12), Nigeria's per capita consumption is 4 times less than the African average and 19 times less than the world average (Sambo, 2009).

At low electricity generation, even despite many effort to increase this, effort should be made to manage effectively the presently generated electricity. Hence the need to look into energy management as a way out of Nigeria's present energy crisis.

CONCEPT OF ENERGY MANAGEMENT

Energy like every other resource is subject to efficient management thus leading to widespread

use of the term energy management. Although energy management has a broader concept, it is synonymous with energy conservation and efficiency, hence its usage in this paper.

The deployment of energy services that brings economic, social and environmental benefit to humanity has instituted a new wave of agenda in human history; the level of energy consumption of a people is now considered a fundamental index for measuring development. Today energy management is at the Centre of national and international objective not only because of saving "energy bills" but for its role in the management of climate change and for sustainable development.

In the light of managing energy that scientist develops a management system to manage the energy process; this system is called the Energy Management System (EMS). It deals with the management of such products which are useful to save the energy such as eco-friendly products or we can say that green products.

In another way, energy management system can be defined as the strategy of adjusting and optimizing

energy using systems and procedures so as to reduce energy requirement per unit of output while holding constant or reducing total cost of producing the output of these systems.

THE NEED FOR ENERGY MANAGEMENT

The need to manage energy in our homes and organization derives its importance from both the global and national perspectives.

From the global perspective; the need to reduce our dependence on the utilization of fossil fuel for energy generation which has led to the price increase of such fuel and subsequent high cost of energy. Also the need to reduce the damage done to our planet as a result of GHG emission in the production and utilization of energy.

From the national point of view, the need to reduce the portion of national and household income spent in order to acquire energy. Achieving this frees up more funds for other advancing economic activities.

ENERGY SITUATION IN NIGERIA

Electricity supply in Nigeria dates back to 1886 when two (2) small generating sets were installed to serve the then Colony of Lagos. 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 (2) was made in 1972 to form the National Electric Power Authority (NEPA), which as a result of unbundling and the power reform process, was renamed Power Holding Company of Nigeria (PHCN) in 2005.

The Nigerian power sector is controlled by state-owned Power Holding Company of Nigeria (PHCN), formerly known as the National Electric Power Authority (NEPA). In March 2005,

President Olusegun Obasanjo signed the Power Sector Reform Bill into law, enabling private

Companies to participate in electricity generation, transmission, and distribution. The government has separated PHCN into eleven distribution firms, six generating companies, and a transmission company, all of which will be privatized. Several problems, including union opposition, have delayed the privatization, which was later rescheduled for 2006.

The Nigeria's power sector is marked by low generating capacity relative to installed capacity and much of the country's citizens do not have access to uninterrupted supply of electricity. At present, electricity generation stood at 3800MW (Mark & Tonye, 2009) while estimated national consumption is in excess of 10,000MW (Sambo, 2008) expected to rise to 40,000MW by 2020 (Mark et al, 2009).

Nigeria is endowed with massive reserves of energy resources which are greatly under-utilized. The government has failed, especially during the 80's and 90's, in development of the sector in order to meet national demand. The last major electric generation installation was in 1990 when the Shiroro power station was commissioned and there has been no major overhaul of any power station for 15 years. The Kainji hydro plant was designed to generate 960MW of power with 12 turbines but only 10 have been installed, hence its 760MW output. The per capita consumption of electricity is 60W and only about 5% of our hydroelectric capacity has been developed. Only 40% of the population has electricity, the majority of who are concentrated in urban areas. It is estimated that an additional 10,000MW in capacity is required to meet current demand. Despite endemic blackouts, customers are billed for services not rendered; these explain widespread vandalism of electricity equipment, power theft as well as PHCN's problem with payment collection.

TABLE 1: Energy resources in Nigeria

ENERGY RESOURCE	RESERVE (UNIT)
Crude oil	36.5Billion barrels
Natural Gas	187.44 Trillion scf
Tar sands	30 Billion barrels of oil equivalent
Coal & lignite	4 Billion tones
Large hydropower	11,250MW
Small hydropower	3,500 MW
Fuelwood	13,071,464 Hectares
Animal waste	61 Million tonnes/yr
Crop residue	83 Million tonnes/yr
Solar radiation	3.5 -7.0kWh/m2-day
Wind	2 - 4m/sat 10m height

Source: Nigerian National Petroleum Corporation ,2007

Renewable Energy Masterplan, 2005

Ministry of Mine and Steel Devt. 2008

As at 2005, Nigeria has approximately 6,861MW of installed electric generation with just 3000MW been produced, thus making power outages a frequent occurrence. Low water level at Kainji, Shiroro and Jebba are frequently claimed to be responsible for the frequent power shortages while the Lagos, Egbin, Delta and PH Afam plants are also operating at below capacity due to gas supply problem and poor maintenance.

Effort have been made to increase power generation and distribution, this resulted in the signing into law, the power sector reform bill which was signed into law 2005. The law sees to the unbundling of PHCN (NEPA) into 11 distribution firms, 6 generating companies and a transmission company. It also permits the participation of private companies in the generation, transmission and distribution of electricity. These have led to the commissioning of Independent Power Projects (IPP) to generate and sell electricity.

In April 2005, Agips 450-MW plant came online in Kwale in Delta State. The

NNPC and Joint Venture (JV) partners, ConocoPhillips and Agip, provided the \$480 million to

construct the plant. IPPs currently under construction include the 276-MW Siemens station in

Afam, Exxon Mobils 388-MW plant in Bonny, ABBs 450-MW plant in Abuja, and Eskoms 388-MW plant in Enugu. Several state governments have also commissioned Oil majors to increase generation including Rivers State, which contracted Shell to expand the 700-MW Afam station.

The Nigerian government also approved the construction of four thermal power plants (Geregu, Alaoji, Papalanto, and Omotosho), with a combined capacity of 1,234 MW to meet its generating goal of 6,500 MW in 2006. In addition fourteen hydroelectric and Natural Gas plants were planned for kick-up but yet to commence since then. Chinas EXIM Bank Su Zhong and Sino Hydro have committed to funding the Mambilla (3,900-MW) and Zungeru (950-MW) hydroelectric projects. In addition, Sino Hydro proposed that it should construct the two power projects. Also, NNPC, in a JV with Chevron are to construct a 780-MW gas-fired thermal plant in Ijede, Lagos State. The project is expected to be constructed in three phases, with the first two phases expected to have capacity of 256 MW each. The plant is expected to be operational in 2007 but yet to commence construction.

Plant	Age (Years)	No of Units	Installed Capacity (MW)	Current No Available	Capacity Available (MW)	Operational Capability (MW)
Kainji	38-40	8	760	6	440	400
Jebba	25	6	578.4	4	385.6	300
Shiroro	22	4	600	4	600	300
Total		18	1938.4	14	1431.6	1000

TABLE 2: Hydro Installed Plant

Source: Engr D J Obadote, Energy Crisis in Nigeria: Technical Issues and Solution, power sector prayer conference, june 25-27 2009

the over 2.5 billion cf/day of gas flared. The government should hence build more power plants especially near flare zones to utilize the hitherto flared gas.

Policies of government should also be geared towards encouraging investment in the power sector (especially FDI) while also decentralizing the sector to permit participation of willing and capable state governments.

Of the over 14,000MW of hydro potential in Nigeria, only 1,900MW have been developed, hence the need to venture into the development of the nation's hydro potential of small rivers spread across the country to build mini hydro power stations.

33% of power generated is lost during transmission and distribution, above the world average of 7 % (9). This obviously should be tackled and reduced to the barest minimum. Investment in T & D equipment is of utmost importance.

Also, the government should pursue rigorously the implementation of the renewable energy master plan which canvasses the development of renewable energy in energy generation.

Finally, the government should undertake institutional reform of the PHCN so as to place it in its rightful place in terms of efficiency and service delivery.

TABLE 3: Thermal Installed Plant

Plant	Age (Years)	No of Units	Installed Capacity (MW)	Current No Available	Capacity Available (MW)	Operational Capability (MW)
Egbin	23	6	1,320	4	880	600
Egbin AES	7	9	270	9	270	220
Sapele	26-30	10	1020	1	90	65
Okpai	3	3	480	3	480	400
Afam	26	20	702	3	350	300
Delta	18	18	840	12	540	330
Omoku	3	6	150	4	100	70
Ajaokuta	N/A	2	110	2	100	80
Geregu	2	3	414	3	414	414
Omotosho	1	8	335	2	80	75
Olounsoyo	1	8	335	2	80	35
Total		93	5,976	44	3,384	2,589

Source: Engr D J Obadote, Energy Crisis in Nigeria: Technical Issues and Solution, power sector prayer conference June 25-27 2009

WAY OUT OF NIGERIA'S ENERGY CRISIS

The major problem facing the country's energy industry has to do with inadequate generation capacity; hence tackling this problem first and foremost requires action geared towards the generation of electricity.

Despite abundance of resources, putting them into use has been a great challenge. Mohammed Bakindo once said that as much as 400mmcf/day of gas produced is left unused as the power plant meant to be use them are not completed. (Nigerian Guardian, March 23, 2010). This is notwithstanding

TACKLING THE NIGERIAN ENERGY CRISIS: ENERGY MANAGEMENT APPROACH

With all the various ways of tackling the Nigeria's energy crisis, a very viable alternative is by practicing energy management. Aside the fact that

it encourages judicious use of already scarce resource, it also ensures a cleaner environment.

It also brings about a result which is felt almost immediately both by the government and the people. More MW will be available for the nation and consumers spends less on energy.

Suggested ways of practicing energy management includes but not limited to:

- Mass enlightenment on the need to save energy and the benefit accruable to such act.
- Implementation of policies to checkmate wastage of energy
 - Replacement of incandescent bulb with CFL bulbs
 - Encourage the importation of energy efficient appliances.
- Ensure effective billing of consumers by utility agencies
- Implementation of policies that encourages consumers, especially residential, to use less energy during peak hours thus freeing up energy use for commercial activities and vice-versa
- Organization and energy consuming industries should be encouraged (if need be enforced) to develop an energy management culture which reduces their energy consumption thus freeing up wasted energy that could have been put into judicious use.
- On the supply side, utility companies must ensure they engage in practices as well as invest in technologies that reduces losses during transmission and distribution (33% of power generated in Nigeria is lost in this process)
- Government should strengthen the National Centre for Energy Conservation and Efficiency (NCECE) so as to enforce strictly the compliance to energy standards that will be established.

CONCLUSION

Energy like other resource is always scarce and hence the need to manage efficiently the available quantity.

Nigeria finds itself in a situation whereby the generated electricity is not even enough to cater for one fifth of its population, despite various efforts by the government to address this problem, it still persist.

However, because of the importance of electricity in the industrialization of a country and hence its development, tackling the issue of energy poverty still have to be accorded much importance.

Practicing Energy Management thus will not only help in making the available resource serve more people while efforts are been made to improve on the generation. It also saves utility cost spent on energy.

Energy management is thus a must if Nigeria is to achieve its vision 20:2020.

RECOMMENDATIONS

In the light of the above listed facts, an analysis of Nigeria's energy situation and the option of solving it through the practice of energy management. The following recommendation is hereby offered:

1. The government should encourage the replacement of incandescent bulbs with CFL bulbs. As it has been established that the costliest energy need in Nigeria is lightening (10-15% of poor household income) and about 23% of total energy consumed by the whole nation. Replacing Incandescent with CFL will save 168W/ household (On the assumption of 4x60W bulb per household being replaced with 4x18W CFL).
2. There should be concerted effort to mass educate the people through the mass media and other means to inform the people on the need to save energy and the benefit derivable.
3. The utility company must be compelled to carry out effective metering of consumer's energy usage.

As this will encourage consumer to save energy knowing fully well it will reflect in their bills.

4. Government should encourage the importation and trading in energy saving appliances (duty waiver) while discouraging or outright banning non efficient ones.
5. Industries should be encouraged if possible compelled to carry out energy management practices and submit a report to government agency annually for monitoring, a practice been done by many countries of the world (bureau of energy efficiency-India, Lebanese Centre for Energy Conservation, UK Dept. for Energy and Climate, Energy Efficiency and Conservation Authority- New Zealand)
6. Energy supplier should improvise on their technology to reduce power loss during transmission and distribution which presently stood at 33%, a far cry above the world average of 7% (.nationmaster).
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