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NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

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BOOKS

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

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UNPUBLISHED DISSERTATIONS AND THESES

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- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

THE NEED FOR ENERGY DEMAND SIDE MANAGEMENT IN COMMERCIAL AND RESIDENTIAL SECTORS IN NIGERIA

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ABSTRACT

As fossil fuels become less attractive due to its high prices and environmental impact, the need to look at the demand side management became imperative for sustainable energy and environment. However, in Nigeria, inadequate supply of energy and low production capacity couple with the need to fuel the most promising economy has necessitated the need for energy efficiency and conservation. Residential and commercial sectors consume up to 80% of the total energy consumption in the country. As such, there is need for a considerable reduction in these high energy consuming sectors for sufficient energy in other sectors especially industrial sector. Subsequently, Energy demand in the country were analysed using indicators of trends, demand elasticities, energy intensities, and future energy trends for the demand side analysis. Consequently, Energy Reduction Programme was considered the most appropriate DSM measure in the country, but massive awareness campaign, new capacity building and electric metres for all consumers have to be provided.

KEYWORDS

Demand side management, Energy reduction programme, Commercial and residential sector, Gig watt Hour (GWh), Million Tons of Oil Equivalents (MTOE).

INTRODUCTION

Persistent domination of fossil fuels in energy mix, its regional concentration and negative effect on the environment, its capital intensive requirement as well as its depleting propensity has necessitated the need for a reasonable reduction and technical efficiency in its consumption. However, electricity sector is one of the most consuming areas of fossil fuels; hence the need to consider reduction in electricity consumption became imperative. Electricity sector involves both the supply side and demand side activities. To ensure efficiency and reduction in electricity consumption, demand side activities has to be considered, which called for the demand side management programmes.

Demand side management (DSM) "is the systematic utility and government activities designed to change the amount and/or timing of customer's use" (Charles River Associates, 2005). In other words, DSM "is the implementation of policies and measures which serve to control, influence and generally reduce electricity demand" (Eric, B., Anne, A., 2006). In some developing countries, DSM became viable option due to the difficulty in capacity expansion and high expensive investment need in the power sector; DSM has been practiced for many decades in different systematic ways. The idea was first put into practice by electric utilities in the USA around 1970s which later spread to other sectors and subsequently beyond the country. It involves both utilizing very efficient appliances and efficient electric consumption behaviour from the end-users.

Commercial and residential users are economically more convenient and appropriate to engage in DSM programmes due to the nature of their consumption and relative low contribution to the economy compare to the industrial sector. Subsequently, the paper concentrated on the Nigerian commercial and residential sectors to consider the urgent need for the application of DSM programmes in these sectors. Nigeria has been experiencing power shortages for long due to the challenges bedevilling the infrastructural development of the power sector alongside increasing demand for electricity. Subsequently, the need to efficiently develop DSM programmes in order to utilize the available distribution capacities to provide accessible electricity to the teaming Nigerian populace became essential. Presently, residential and commercial sectors consume more than half of the total electricity distributed in the country (see table one in appendix). Residential sector which includes activities like cooling, use of appliances, heating and lighting while commercial sectors include activities in transacting trade, schools, offices, hotels, university etc.

The Nigerian electricity sector dated back in 1896 and since then experienced different reforms, all the reforms were targeted at ensuring effective operation of the power sector to sufficiently meet the increasing energy demand for economic growth. The recent one was the 2005 electricity sector reform act that was enacted to liberalize the electricity market especially the generation and distribution segments. Subsequently, the power sector was unbundled into six generating companies, one transmission company and eleven distribution companies with only two Hydro plants and four Gas turbine stations supplying the whole country. However, power issues and challenges have persistently becoming a dominant economic obstacle. The aim may not be achieved unless the government or utilities deploy the use DSM programmes at a short-term period.

There are other benefits to enjoy from implementing DSM programmes; this could be to the end-users for reduction in energy cost and the utility for efficient utilization of its available capacity. DSM programmes help the utility to have extra capacity while supplying the same level of demand, which provides the opportunity to promote its sales by selling the extra capacity to new customers thereby enhancing revenue. Therefore, revenues acquired by utility will be more profitable to invest on DSM and energy saving programmes than expanding its production capacity. This is further justified by the fact that capacity expansion result in more consumption, which will be detrimental to environmental condition, and which will also be more expensive to cure. Governments and utilities can therefore implement different DSM programmes on electricity consumption to achieve efficiency and more revenues.

Nigeria has a relative large production capacity compare to the total electricity distributed annually due to inadequate supply of Gas to the power plants. However, Increase in population, urbanization and use of appliances has continue to push the demand for electricity higher, with no or little effort to enhance the generating or distribution capacities to offset the demand. Therefore, it will be more economical and politically wise to consider DSM programmes in Nigeria to meet the energy demand.

Residential sector is one of the large energies consuming sectors in Nigeria due to the nature and pattern of appliances usage, like refrigerators which used to be in force almost 24 hours, standby electronics (despite the small unit of the standby power), high voltage electric lamp which used to be turned on even on the daytime and placed in unnecessary locations, couple with timely use of appliances like water heater, microwaves, Irons etc. All these have added to the power consumed by the residential sector which if the consumption pattern is managed efficiently, large capacity would be spared for the industrial sector utilization. Similarly, commercial sector need to improve efficiency in its energy consumption to save more energy. It constitute the use of air conditioning, computer equipment, photocopy machines, printers, fax machines, lifts, lighting etc.

LITERATURE REVIEW

CSPM (California Standard Practice Manual), (2001), studied load management program, they stated that the program is targeted toward manipulating the distribution of the demand as well as the time of power utilization; usually it is implemented by utilities by changing the pattern of loading and encouraging low demand during the peak hours, they argued that this is the most effective technique of energy conservation. This opinion is supported by Swisher, J. N., G.M. Jannuzi, and R.Y. Redlinger, (1997), but they categorised it into two: clipping and filling technique. Clipping by reducing or shifting the load during the peak hours to the off peak period and filling by providing additional capacities (thermal storage) to meet the increasing loads during the off peak period, this is done devoid of affecting the pattern of electronic usages. They cited example of thermal heat storage, which can be used to store heat during the off peak period for utilization in the peak period.

Charles River Associates (CRA, 2005), emphasized on load levelling technique, which they categorised under Load Management program and is aim at making an efficient use of the available capacities devoid of the need for additional reserve capacities to offset the hours of high demand. They categorised it into two: Peak Clipping and Valley Filling**.** According to them, Peak Clipping is where the utility tries to reduce consumption during the peak hours thereby clipping the overall load during the peak periods as shown in figure one. This can be achieved by limiting the use of equipment and appliances during the peak hours. While, Valley Filling this is another option in which the off peak period is provided with a special energy capacities without affecting the load of the peak period. This is usually provided through thermal energy storage to substitute fossil fuel. According to Sustainable energy regulation and policy for Africa (2005), two possible options are considered appropriate for African, which are: Load Growth and Conservation. It involves increasing the consumption level tactically in order to develop customer productivity and increasing the revenues for utilities. This is done by enhancing the energy access to new customers or areas, Thereby enhancing the utilities' market share which enables it to provide enough supply of power in the off peak and on-peak period. Load conservation on the other hand involves low supply of electricity and efficient utilizations of energy by changing the pattern in the usage of appliances. It is directed by utilities to influence the loading system. Applying the two techniques will not necessitate the need for additional capacities despite the new consuming areas because the energy saved from the energy conservation will be used to supply the new consuming areas.

Several researches were equally conducted on the possible techniques to apply in Nigeria, According to Prof. B. Garba (2009), Nigeria shall explore the vast potential of renewable energy sources as a measure against energy supply security concern, he also stressed on other government policies and establishments that are targeted toward enhancing energy conservations. Prof. S.T. Wara (2011) he stressed on the necessary steps before implementing any DSM program, where he mentioned Demand Forecasting, Load and Market Research, as well as Financing as the major prerequisite for effective implementation of DSM in Nigeria. Lugano Wilson (2006), emphasized on African most effective techniques of Energy conservation, which he called Energy Reduction Programs (ERP), whichhe described as the option that is aims at reducing energy demand by employing more efficient practices, equipment and buildings. However, some of these measures may involve capital investment; they involve high and low energy saving tips, like observing combustion condition of boilers in the process of producing steam or hot water to ensure optimum efficiency. Lighting is another area where these programs can be applied, where the usage of efficient fluorescent and other energy saving lighting devices are recommended. Similarly, removal of high consuming lamps out of the system and installation of automatic light switch system are one of the recommendations of ERP.

SUBJECT IMPORTANCE

The research is important and timely considering the continuous decline in the average supply of energy which hinders the country's industrial growth and social wellbeing of the citizens, hence the need for immediate enhancement of energy access. Similarly, the country's inadequate supply of energy is largely attributed to the low supply of Natural Gas (to power the Gas turbines) as well as the low generating capacity, which require long term plan and huge monetary requirement to expand, consequently, Nigeria can only improve the energy access by applying some Energy Conservation techniques, which this paper explores in order to serve as a policy guide to the government and behavioural recommendation to citizens on how to conserve energy as immediate measure to increasing energy access and as a short term measure to addressing energy supply problem in the country.

STATEMENT OF PROBLEM

Low energy supply is principally instrumental toward increasing the average cost of production in the manufacturing sector, which make the economy unattractive to foreign investors and contribute to inflation. Subsequently, the research studies the need for the energy demand side management with a view to identifying the most appropriate conservation technique and the possible recommendation for effective implementation of the suitable technique.

However, as fossil fuels (source of energy) become less attractive due to its high prices and environmental impact, the need to look at the demand side management became imperative for sustainable energy and environment. However, in Nigeria, inadequate supply of energy and low production capacity couple with the need to fuel the most promising economy has necessitated the need for energy efficiency and conservation. Residential and commercial sectors consume up to 80% of the total energy consumption in the country. As such, there is need for a considerable reduction in these high energy consuming sectors for sufficient energy in other sectors especially industrial sector.

OBJECTIVES

The objective of the research is to identify the most appropriate Demand Side Management program/technique that can immediately enhance the energy access in the country. The paper is also aim at identifying the benefits from energy conservation in the residential and commercial sector of the economy. It is also aim at discovering how DSM program can bring about immediate solution to the energy problem in the country.

HYPOTHESES

1. There is huge energy save from energy conservation program in Nigeria.
2. There will not be increase in energy access upon implementing energy preservation techniques in the country
3. Applying DSM will bring about immediate solution to energy problem in the country.
4. Reduction in energy consumption from residential and commercial sector will enhance industrial growth in the country.

METHODOLOGY

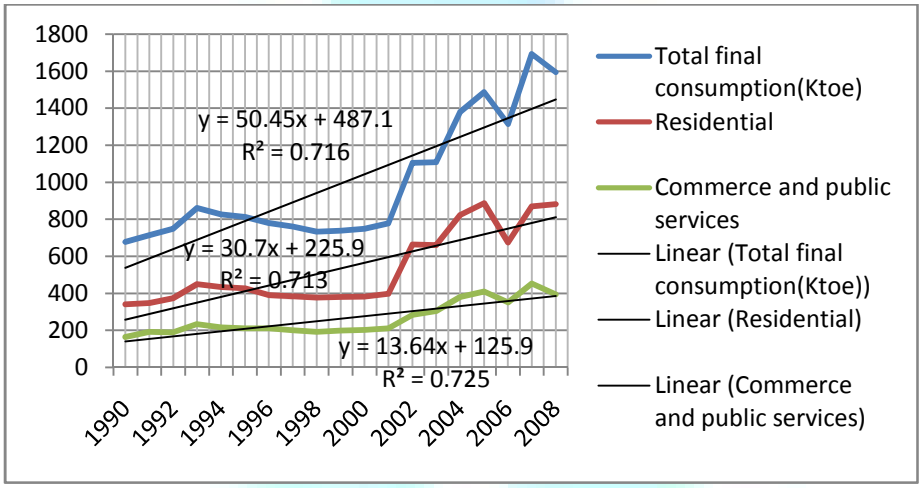
To identify the necessity of and appropriate DSM programme in Nigeria, it is germane to look at some facts on the country's electricity sector especially the consumption pattern of the electricity, its trend, and the rate at which it grows as well as the residential and commercial sectors' shares in the total consumption. To achieve this some economic tools were applied in determining the past and future energy demand trend, growth rates as well as the percentage share of the two sectors in the overall energy demand in the country. Energy production, Intensity and per-capita consumption were calculated to determine the potential areas and measures for energy efficiency.

TABLE 1: TREND OF SECTORAL ENERGY CONSUMPTION

TIME	Total final consumption(Ktoe)	Residential	Commerce and public services
1990	676.906	339.614	163.916
1991	713.112	346.064	191.436
1992	748.114	373.24	187.652
1993	859.828	448.662	233.404
1994	825.17	433.182	216.204
1995	811.496	425.7	210.614
1996	778.472	390.268	210.958
1997	760.498	382.872	199.262
1998	732.806	376.766	191.092
1999	737.536	379.862	197.628
2000	747.168	381.066	201.756
2001	776.924	396.288	209.754
2002	1104.498	663.49	283.628
2003	1106.562	659.534	304.268
2004	1379.096	821.902	379.26
2005	1486.596	885.972	408.844
2006	1313.048	673.552	350.622
2007	1691.706	867.826	451.672
2008	1592.462	880.64	393.364
TOTAL	**18841.998**	**10126.5**	**4985.334**

Source of Data: IEA (2010)

FIG 1: CHART DEDUCED FROM ABOVE TABLE



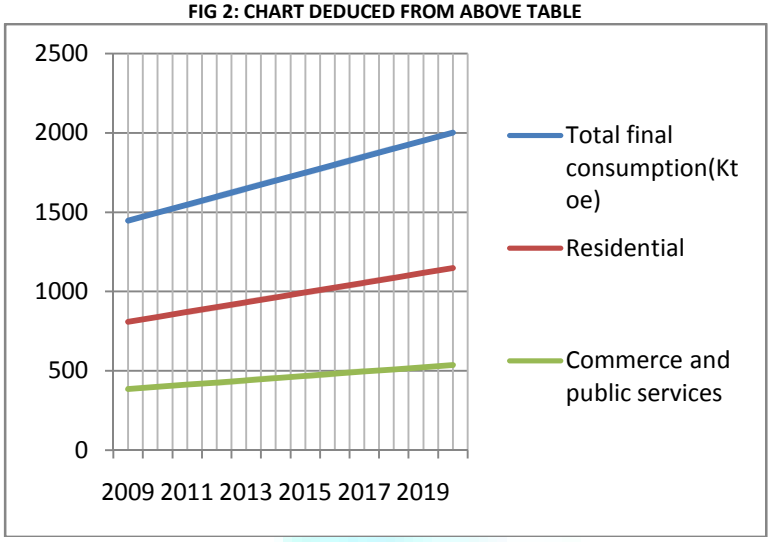
GROWTH RATE FOR FIN. CONSUMPTION	4.87%
GROWTH RATE FOR RES. CONSUMPTION	5.44%
GROWTH RATE FOR COMM. ONSUMPTION	4.98%
Percentage share of residential	53.74
Percentage share of commercial	26.45863
Percentage share of Others	19.80

TABLE 2: FORECAST OF SECTORAL ENERGY CONSUMPTION

TIME	Total final consumption(Ktoe)	Residential	Commerce and public services
2009	1445.785	809.27	385.231
2010	1496.24	839.97	398.88
2011	1546.695	870.67	412.529
2012	1597.15	901.37	426.178
2013	1647.605	932.07	439.827
2014	1698.06	962.77	453.476
2015	1748.515	993.47	467.125
2016	1798.97	1024.17	480.774
2017	1849.425	1054.87	494.423
2018	1899.88	1085.57	508.072
2019	1950.335	1116.27	521.721
2020	2000.79	1146.97	535.37

Source of Data: IEA (2010)

FIG 2: CHART DEDUCED FROM ABOVE TABLE



RESULTS & DISCUSSION

Table one and two illustrated the fast and future energy demand for the residential and commercial sectors, using a simple trend and growth rate analysis in the forecast. Period used in the past analysis were 1990 to 2008, and 2009 to 2020 for the future forecast. Table one is showing the trend of the Nigerian total final consumption (domestic supply less losses and energy consumed by energy industry) in Ktoe unit from 1990 to 2008. From the past trend, the rate at which Nigerian electricity demand expanded could be difficult to be met immediately due to the low growth in energy production, the immediate solution is to employ an efficient utilization of the available capacities and reduction in the electricity consumption.

The growth rate for final electricity consumption was averagely 4.87% annually (see table one), which is higher than the energy production growth rate of 2.31% (table three in appendix). Similarly, energy intensity has reduced very insignificantly with 1.84% reduction (table three in apendix), the intensity which was calculated on toe/thousand US$ was 4.30 in 1990 and reduced to 3.08 in 2008. This indicates lack of enough efficiency in energy usage and greater increase in consumption than production. At the sectoral levels, the residential and commercial sectors consumed up to 80% of the final energy consumption, 53.74% for residential and 26.46% for commercial sectors (see table one). Therefore, DSM programs are more appropriate to be applied in the residential and commercial sectors considering the huge consumptions recorded in the two sectors so that more energy can be saved to meet the escalating demand. Therefore, among the DSM programmes, Energy Reduction Programmes (ERP) would be more appropriate for Nigeria in order to substantially reduce the demand for electricity, maintain environmental sanity, escape fossil fuel price shocks and meet the increasing demand before the capital intensive capacity expansion is achieved. This is explained more in the following chapter.

FINDINGS, RECOMMENDATIONS/SUGGESTIONS

Based on the above analysis, the energy reduction option is found to be more appropriate as it concentrate more on the end-users of electricity; it controls directly the consuming habits of households and commercial users, which constitute about 80% of the total electricity consumption (table one). Lighting, cooling, ironing, water heating, cooking, electronic appliances and computer equipment are the elements causing high electricity consumption in both residential and commercial sectors in which no efficiency is applied in terms of its usage and operation in Nigeria. Some of the appliances like irons and microwaves which are used timely contribute less compare to other consuming activities that are used frequently. Even standby appliances when accumulated the total power they consume, add a lot to overall consumption.

For commercial and service sector, air conditioning and use of computer equipment consume more energy in offices and stores, while hotels and restaurants consume more from water heating. The unit consumption of computers, photocopy machines and printers might be low, but their number has continue to increase leading to huge consumption in total. Standby consumptions are estimated to be two-thirds of the total appliances electricity demand, which means only one third of the demand is used in operating the appliances. Use of lift in offices and hotels add significantly to electricity consumption.

Energy reduction programme (ERP) is directly connected toward ensuring efficient use and energy saving attitude in terms of the above electricity consumption activities. Some of the measures by ERP do not attract any cost in its implementations. In order to achieve energy efficiency and reduction using ERP the following measures has to be employed.

ENERGY SAVING AREAS

LIGHTING & BUILDINGS

Lighting is a very good opportunity of saving energy in Nigeria, but to achieve this, first there must be an updated record of energy users and metres, which in Nigeria is seriously lacking because, many households live in areas that are not even motor-able, and tend to connect to the electric poles directly without registration or metre. The second step is to wipe away the existing electric lamps, as an average electric lamp now in Nigeria is 60 watt, some use 100 watts, under ERP the government shall prevent the production and importation of these kinds of electric bulbs and provide incentives for the use of more efficient ones that consume around 10 to 15 watts. Thirdly, the electricity regulatory body shall initiate a penalty or punishment to any household or offices that turned on their lights in the daytime or in areas where lighting is not required. If consumers pay exactly what they consume, they tend to be more efficient to save their income. Natural light should be effectively utilized. Ageing bulbs consume more electricity therefore cleaning, replacement and maintenance should be carried out frequently.

For buildings, this may require cost and medium term to adjust, large windows should be provided to allow sufficient breath into rooms and people should avoid building in congestion areas. This is important in Nigeria due to the hot temperature which may not be the same thing in other countries. Similarly, white or light painting should be applied in buildings.

EQUIPTMENTS AND APPLIANCES

Standby appliances should be turned off when not in used, office computers, photocopiers and printers should be turned off as well except when in use. Washing machines should be used only when there are full loads of clothes. Fridges should be left closed as much a possible because, opening it allows cold air to escape, and warm foods should be left to be cold before putting it into the fridge, so as to easy the cooling system and save more electricity. However, when not necessary, it should be turned off, and freezers should be frequently defrosted. The number of air conditioners in offices and houses should be reduced. Wide and open buildings should be constructed where breath could penetrate easily. All outdated appliances should be replaced with modern and efficient ones. Similarly, energy consumption capacity levels of equipment should be labelled.

HEATING, COOKING AND OTHERS

Water heating is more demanded by hotels and restaurants, it is rarely required for houses except for winter, and hot water cylinders should be set at low degrees (50^0C). Alternatively, due to the abundance of solar energy in the country, solar water heating system should be installed. Frequently and un-necessary cooking should be reduced, and cooking materials should be made easier and soft before cooking e.g., beans should be placed in a water for a while to get soft

before cooking, or any other techniques to reduce the length of the cooking period because the longer the cooking the higher the energy needed. Pressing irons should be set at low level and avoid frequent use.

AWARENESS

All of the above techniques cannot be achieved unless the households and commercial users are sensitized and made aware of the need to save more energy, as well as the attitudinal and structural requirement to achieve that. "Energy savings and energy efficiency improvements depend on the combined efforts of many individuals, well motivated personnel are best able to develop and implement energy efficiency policies that are crucial for continued energy efficiency improvement in their organizations. It is therefore, necessary to raise awareness by campaigns informing the staff of energy-consuming organizations and households about energy efficiency options and specific DSM techniques" (Lugano Wilson, 2006).

This kind of campaign should be made individually and through the use of media, drama, video films, posters. But individual campaigns is preferable in Nigerian case due to low access to social amenities especially in local communities e.g. Television, Radio.

BENEFITS

Some of the benefits to be derived upon implementing ERP in Nigeria include the following:

COST REDUCTION: total cost of energy production (in terms of building capacities) and the cost of providing energy to new customers are relieved because the energy saved from DSM program will be transferred to new demand. Similarly, this will help provide sufficient energy and reduction in tariff for all when new capacities are established.

ENVIRONMENTAL IMPROVEMENT: reduction and efficient use of electricity consumption will reduce the need for generating more energy, and impliedly reduction in burning fossil fuels that release emission thereby saving the environment.

RELIABILITY OF NETWORKS: too many loads on electricity network may cause damages, sparks or blast of electrical infrastructures. DSM programmes are geared toward reducing such loads, thereby enhancing the reliability of electric networks. Other benefits as highlighted by Satish Saini, (2004) include the following:

- Reduction in the need for new power plant, transmission and distribution networks
- Stimulation of economic development since wasteful use of energy is reduce
- Creation of long-term jobs to new innovations and technologies
- Reduction in air pollutions
- Reduce dependency on foreign energy sources
- Reduction in peak power prices for electricity

CHALLENGES

Some of the challenges that could be faced while implementing any DSM program in Nigeria include the following:

- Lack of awareness on the importance of energy efficiency which was attributed to lack of education and access to social amenities like televisions and radio.
- Lack of commitment from government.
- Illegal connections to electric poles i.e. lack of proper record of electricity consumers and metres.
- Lack of skilled personnel to undertake energy audits.
- Low distribution capacities and short supply of Natural Gas to the Gas turbine plants.
- Gas pipeline vandalism and Bunkering.
- Expensiveness of the more efficient appliances and electric bulbs.

CONCLUSIONS

Power outage has continued to be the major cause for economic backwardness in Nigeria, several efforts were made to ensure adequate supply of energy in the country, but all prove abortive. However, Nigeria has a relatively sufficient capacity to provide a sufficient supply of power (table three shows 226.79Mtoe of energy production against 19120GWh of electricity consumption in 2008) but the outage is becoming more frequent. Subsequently, there is an urgent need to find alternative and immediate solution to the problem, and from the discussion in this paper, it was found that Demand Side management is the most effective solution to the Nigerian power problem. However, Energy Reduction Program (ERP) is found to be the most convenient DSM program for energy reduction in both the residential and commercial sectors, which were found to consume up to 80% of the total electricity consumption in the country.

Therefore, for the ERP to be implemented effectively and to achieve adequate electricity supply in the country, the National Electricity regulators, Energy Commission and other Institutions in the electricity sector should make energy efficiency a priority and engage on massive individual campaign especially in the rural areas. The marketing should be undertaken by personnel that has knowledge and understanding of DSM systems and opportunities. Similarly, electric metres should be enforced generally and incentivised to low income earners in order to verify the amount of energy consumption accurately and allow easy and effective electricity billing and payment. Finally efforts should be made to develop new capacities using different energy sources especially renewable energies and natural Gas, because the existing capacities are relatively inefficient to implement effective DSM programmes.

SCOPE FOR FURTHER RESEARCH

There is need for a further research on the economic evaluation of implementing the ERP in Nigeria, so as to serve as a financial guideline to the government, utilities and consumers.

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ANNEXURE

TABLE 3: TREND OF ENERGY INTENSITY, ENERGY PER CAPITA, AND EXCHANGE RATE

TIME	Energy production (Mtoe)	Electricity consumption (GWh)	GDP (billion 2000 USD using exchange rates)	Population (millions)	Electricity consumption per capita(GWh)	Energy Intensity(toe/thousand $)
1990	150.45	8290	34.98	94.45	0.0878	4.30
1991	156.71	8750	36.64	97.25	0.0900	4.28
1992	161.99	9020	37.71	100.1	0.0901	4.30
1993	164.88	10360	38.54	103.02	0.1006	4.28
1994	166.16	10060	38.58	105.99	0.0949	4.31
1995	169.19	9880	39.54	109.01	0.0906	4.28
1996	181.96	9510	41.24	112.08	0.0849	4.41
1997	193.86	9300	42.36	115.19	0.0807	4.58
1998	188.58	8950	43.15	118.35	0.0756	4.37
1999	187.91	9040	43.63	121.54	0.0744	4.31
2000	202.02	9110	45.98	124.77	0.0730	4.39
2001	211.62	9480	47.41	128.04	0.0740	4.46
2002	196.63	13460	48.14	131.34	0.1025	4.08
2003	216.17	13440	53.1	134.66	0.0998	4.07
2004	229.12	16730	58.73	138	0.1212	3.90
2005	232.22	17960	61.9	141.36	0.1271	3.75
2006	234.04	15930	65.74	144.72	0.1101	3.56
2007	230.24	20330	69.98	147.98	0.1374	3.29
2008	226.79	19120	73.68	151.32	0.1264	3.08
Growth rate	**2.31%**					**-1.84%**
Forecast		y = 603.58x + 6002.1	y = 2x + 28.475	y = 3.18x + 90.262		y = -0.0548x + 4.6535
YEAR	**Energy production (Mtoe)**	**Electricity consumption (GWh)**	**GDP (billion 2000 USD using exchange rates)**	**Population (millions)**	**Electricity consumption per capita(GWh)**	**Energy Intensity(toe/thousand $)**
2009	240.13	17470	66.475	150.68	0.1159	3.61
2010	243.60	18074	68.475	153.86	0.1175	3.56
2011	246.85	18677	70.475	157.04	0.1189	3.50
2012	249.89	19281	72.475	160.22	0.1203	3.45
2013	252.70	19884	74.475	163.40	0.1217	3.39
2014	255.30	20488	76.475	166.58	0.1230	3.34
2015	257.67	21092	78.475	169.76	0.1242	3.28
2016	259.83	21695	80.475	172.94	0.1254	3.23
2017	261.77	22299	82.475	176.12	0.1266	3.17
2018	263.49	22902	84.475	179.30	0.1277	3.12
2019	264.99	23506	86.475	182.48	0.1288	3.06
2020	266.27	24110	88.475	185.66	0.1299	3.01

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