Politics of Energy Sustainability and Adoption of Modern Day Best Practices: Nigeria in View

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Abstract. The study examines the problems of electricity generation; challenges encountered and proffer solutions to the epileptic electricity supply in Nigeria. The study was a descriptive survey. Three research questions and two hypotheses guided the study. The population comprised 1870 EEDC staff. A sample size of 532 was used for the study. Data were collected through questionnaires, key informant interview (KII) and analyzed using thematic analysis, mean and ANOVA. The results showed that systemic corruption, etc. were behind insufficient power generation. The study found out that policies implemented to reform power sector is faced with emerging challenges stretching from inadequate infrastructure, inconsistent government policies and huge metering gap. The study also discovered that the solutions to the erratic power supply lies strongly on the decentralization of power sector, building capacity for local manufacturing and repairs of renewable power systems. The paper recommends that government demonstrate some degree of political willingness by formulating and implementing consistent policies, reforms to attract more local and foreign investors into the power sector.

Key words: Politics, Energy, Sustainability, Electricity, Nigeria.

1. Introduction

Electricity is an indispensable commodity for the advancement of both the micro and macro economies of the world. It promotes the socio-economic activities of households through the provision of energy that supports basic needs such as cooking, heating and lighting. As well as the use of appliances, piped water or sewerage, communication, transportation etc. At the national level, electricity provides energy for productive activities including agriculture, health, education, commerce, manufacturing, industry, mining etc. The role of energy in the advancement of human activities and the economy at large is recognized by modern societies, and such has influenced energy policy globally.

Energy policy is the way in which government determines energy development. It includes energy production, distribution and consumption respectively. According to
Musbaudeen et al. [14] energy policy typically includes a government’s specific strategy to explore, exploit, manage and preserve its diverse energy resources, and portfolio to primarily satisfy its local energy demands. Energy policy may include legislation, international treaties, incentives to investment, and guidelines for energy conservation, taxation and other public policy techniques geared toward access to reliable, affordable and sustainable energy.

Lund et al. [13] defines sustainable energy as energy sources that are not expected to be expendable in the course of time and at the same time relevant to the human race; therefore, such energy sources contribute to the sustainability of all species. In the words of Kutscher et al. [12] sustainable energy is the use of energy in a way that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. This means that sustainable energy is power which is able to be replenished within a human lifetime and cause no long-term damage to the environment. Sustainable energy includes all renewable energy sources, such as hydroelectricity, biomass, and geothermal, wind, and wave, tidal and solar energies.

However, meeting the world's electricity needs sustainably is widely considered to be one of the greatest challenges facing mankind in this modern time. According to [3] report, worldwide, nearly a billion people lack access to electricity, and around 3 billion people rely on smoky fuels such as wood, charcoal or animal dung in order to cook. These and fossil fuels are a major contributor to air pollution, which causes an estimated 7 million deaths per year. Production and consumption of energy emits over 70% of human-caused greenhouse gas emissions.

It was as a result of these challenges confronting humanity as regard to access to reliable and sustainable electricity that necessitated pathways that could improve greater access to electricity, reduce global warming and shift nations towards more use of renewable electricity. Achieving these requires government political will in the formulation and implementing of policies that will improve energy generation, distribution and transmission respectively. As a result of this, the energy policy of nations is seen to be assuming a more and more important role as it concerns the energy development.

Unfortunately, it is not the case in Nigeria. Over the years, the Nigerian electricity sector has become a site of struggle by past political administrators over governance and ownership with respect to generation, distribution and transmission. The long-standing government-owned monopoly in the power sector became a huge hindrance to the development of the power sector. Although, efforts were made to privatize all her power assets with a view to ending the country’s chronic power shortages and long-standing monopoly of the sector by the state-owned power entity [16].

Thus, several energy policies emerged solely to reform the sector. Notable among them were: 2005 Electric Power Sector Reform Act, 2010 Roadmap for Power Sector Reform, and subsequently the 2013 Roadmap for Power Sector Reform Revision 1, among several other policy documents. They emphasized privatization of a hitherto government-owned electricity company that has monopolized electricity generation, distribution, and transmission for decades. Aside these functions, the policies and reforms aimed at removing obstacles to private sector
investment in the power sector, all in a bid to improve energy independence and diversify energy sources towards cleaner energy such as solar, geothermal, and wind. One specific proposed strategy that would promote technology-specific incentives in the face of power sector privatization is the design of a feed-in tariff system which allows producers of renewable energy to sell their power to the national power grid at considerably higher prices than those generating power through the conventional sources of coal, gas, and hydro. Added to this are the guaranteed purchase of energy by the Nigerian Bulk Electricity Trading company (NBET) and a five-year tax-free period for investment in renewable energy [16].

Despite the bold step taken and how laudable the energy policies were, the sector is still confronted with a number of challenges. These include: raising long-term finance for the emerging generation and distribution companies with estimated required annual investment of US$7.5 billion between 2014 and 2020; sourcing the required manpower with the requisite skills for the emerging privately owned distribution and generation companies; creating an effective gas pricing system and tackling insufficient gas supplies to some power plants across the country; and staying the course of the reform given the challenging political and macroeconomic environment. The most prominent of these according to [16] is the political environment surrounding the reform, mainly regulatory and institutional issues.

Sadly, all of these challenges made manifest on the access of electricity by Nigerians. According to official statistics, 77 million Nigerians have no access to grid power [10] and 80% of those with grid access use expensive diesel- and petrol-fuelled back-up generators as an alternative to the unreliable grid supply [9]. Other surveys indicate that there could be as many as 120 million people, or 75% of the population, currently living without access to reliable and affordable power [5]. Nigeria’s insufficient generation and transmission capacity and the high costs of self-generation affect all aspects of the economy, from rural livelihoods to manufacturing and exports. Households and SMEs spend two to three times more on kerosene, diesel and petrol than they do on grid-based electricity [16].

To address this issue, several works were carried out. A few studies have attempted to assess the energy sector reform in Nigeria [1]; Idris et al. [7]; [11, 19, 20, 24, 25]. Some have focused on the investment opportunities and pitfalls offered by the reform [4]; Onochie et al. [21]. Others have assessed the impact of the reform Adoghe et al. [2]; [18]. Yet others have looked at it from consumer perspective [15]. These and more studies like Musbaudeen et al. [14]; [23] attempted to influence policy and policy makers to adopt policy recommendations which will see the country energy subsistent in an environmentally sustainable manner. Indeed, there is very little if any evidence-based research on the politics of energy sustainability and adoption of modern day best practices in Nigeria. Hence, the present study.

1.1. Purpose of the study
The main purpose of this study is to carry out a study on the politics of energy sustainability and adoption of modern day best practices in Nigeria. In particular, the study:

- examined the problems of electricity generation in Nigeria;
examined the challenges encountered in the distribution of electricity in Nigeria; and
proffer solutions to the epileptic electricity supply in Nigeria

1.2. Research questions

- What are the problems of electricity generation in Nigeria?
- What challenges are encountered in the distribution of electricity in Nigeria?
- What are the solutions to the epileptic electricity supply in Nigeria?

1.3. Hypothesis

- There is no significant difference in the mean responses of EEDC staff of district I, II and III on the challenge encountered in the distribution of electricity in Nigeria
- There is no significant difference in the mean responses of EEDC staff of district I, II and III on the solutions proffered to the epileptic electricity supply in Nigeria

2. Methodology

2.1. Research design
The study adopted a descriptive research design. This research combined both quantitative and qualitative technique which allowed for the process of triangulation.

2.2. Area of the study
The study was carried out in Anambra State in South East Nigeria.

2.3. Population and sampling technique for the study
The population comprised 1870 EEDC staff. A sample size of 532 was determined by the use of Taro Yamani. After which 527 respondents were selected using proportionate stratified sampling technique, while 5 key informants were purposively selected.

2.4. Instruments for data collection
A structured questionnaire and key informant interviews (KII) designed by the researchers were the instrument used for data collection. The questionnaire consisted of two sections I and II. Section I provided personal information of the respondents while section II was made up of three clusters according to the three specific objectives/research questions. Responses to the items in the questionnaire were based on a four-point Likert type rating scale, ranging from Strongly agree (SA) (4 points), to Agree (A) (3 points), Disagree (D) (2 points), and Strongly disagree (SD) (1 point). The instrument was duly validated by three experts (2 from the Department of Political Science, Nnamdi Azikiwe University, Awka) and 1 from Department of Computer Science, Nnamdi Azikiwe University, Awka). Reliability of the instrument was ascertained using Cronbach Alpha. A reliability coefficient of 0.87 was established which signified very high reliability of the instrument. While the key informant interviews were made up of the theme about the research questions used to elicit information from participants.
2.5. Data collection
Direct method was applied by the researcher and one research assistant in distributing and collecting the questionnaire from the respondents at the respective EEDC districts used for the study. The research assistant was briefed on the modalities for distributing and collecting the questionnaire from the respondents on the spot. This ensured that the respondents appropriately complete the questionnaire. Thus, there was 100% return of the questionnaire, and were duly used for data analysis. For the qualitative data, permission to record conversation using audio tape recorder was sought first. The interview was scheduled for 30 min per interviewee. Finally the responses from the participants were transcribed.

2.6. Data analysis

- The data analyses employed in this study were both descriptive and thematic analysis. For the qualitative data analysis, all the transcribed data were imported into NVivo to further facilitate the analysis because of the huge data involved. Descriptive statistics (mean and standard deviation) were used for quantitative data analysis. A criterion mean of 2.50 was used as the benchmark for decision making for each item, since a four-point rating scale was used for the study. Thus any item with a mean of 2.50 and above was considered as accepted by the respondents, while any item with a mean below 2.50 was considered as unaccepted by the respondents.
- Analysis of variance was used to test the differences among the mean responses of the EEDC staff across the respective districts at \( P < 0.05 \).
- All computations were carried out using Nvivo version 11 and the Statistical Package for Social Science (SPSS) version 22.0.

3. Results
Five hundred and twenty seven respondents completed the questionnaire. The mean ratings of the respondents comprising staff of EEDC among the three districts on each of the items in the questionnaire were computed. The results are presented in the Table according to the three research questions and two hypotheses that guided the study. Similarly, the responses of the five participants were recorded, transcribed, analyze and the results were also presented accordingly.

**Research question 1:** *What are the problems of electricity generation in Nigeria?*

| S/N | Problems of electricity generation | X    | SD  | Decision |
|-----|-----------------------------------|------|-----|----------|
| 1   | Monopolizing the power sector     | 2.79 | 0.87| Accepted |
| 2   | Irregular gas supply             | 3.46 | 0.71| Accepted |
| 3   | Corruption                       | 3.51 | 0.85| Accepted |
| 4   | Lack of energy mix               | 3.31 | 0.86| Accepted |
| 5   | Obsolete power equipment         | 3.35 | 0.86| Accepted |
| 6   | Poor maintenance culture and planning | 3.33 | 0.82| Accepted |
| 7   | Non-completion of integrated power project | 3.36 | 0.69| Accepted |
| 8   | Low staff morale                 | 2.25 | 0.86| Rejected |
Lack of technical know-how 2.23 0.87 Rejected

N= 527, X = Mean, SD = Standard Deviation

Result in Table one shows that items 1-7 had mean scores above 2.50. This indicate that the problem of power generation in Nigeria were tied to the following: monopolizing the power sector, irregular gas supply, corruption, lack of energy mix, obsolete power equipment, poor maintenance culture and non-completion of integrated power project. However, low staff morale and lack of technical know-how were not problems confronting power generation (X < 2.50).

**Research question 2:** *What challenges are encountered in the distribution of electricity in Nigeria?*

**Table 2:** Mean responses of the respondents on the challenges encountered in the distribution of electricity in Nigeria

| S/N | Challenges encountered in the distribution of electricity | X    | SD  | Decision |
|-----|----------------------------------------------------------|------|-----|----------|
| 1   | Inadequate transmission and distribution of infrastructure | 3.29 | 0.87| Accepted |
| 2   | Inconsistence government policies                        | 3.60 | 0.71| Accepted |
| 3   | Overloaded transformers and bad feeder pillars            | 3.59 | 0.85| Accepted |
| 4   | Huge metering gap                                        | 3.56 | 0.86| Accepted |
| 5   | Inadequate logistic facilities                           | 3.03 | 0.86| Accepted |
| 6   | Political interference                                   | 2.99 | 0.82| Accepted |
| 7   | Centralization of the power systems                      | 3.00 | 0.69| Accepted |

N= 527, X = Mean, SD = Standard Deviation

From Table 2, it can be seen that all items had mean scores above 2.50 indicating that the distribution of electricity is faced by numerous emerging challenges.

**Research question 3:** *What are the solutions to the epileptic electricity supply in Nigeria?*

**Table 3:** Mean responses of the respondents on the solutions of epileptic electricity supply in Nigeria

| S/N | Solutions                                                  | X    | SD  | Decision |
|-----|------------------------------------------------------------|------|-----|----------|
| 1   | Decentralization of electricity generation                 | 3.06 | 0.87| Accepted |
| 2   | Formulating and implementing policies that allows for a level playing ground for other sources of electricity generation | 3.53 | 0.71| Accepted |
| 3   | Building capacity for local manufacturing and repair of power systems, solar PVs, small wind turbines etc. | 3.57 | 0.85| Accepted |
| 4   | Adequate funding                                          | 3.40 | 0.86| Accepted |
| 5   | Government disengagement in power business                | 3.16 | 0.86| Accepted |
| 6   | Completion of on-going and abandoned project              | 3.12 | 0.82| Accepted |

N= 527, X = Mean, SD = Standard Deviation
Result in Table 3, shows that items 1-6 had were prominent measure that can deal with the epileptic power supply in Nigeria (X > 2.50).

**Hypothesis 1:** There is no significant difference in the mean response of EEDC staff of district I, II and III on the challenges encountered in the distribution of electricity in Nigeria

**Table 4:** Analysis of variance on the mean differences of the responses of EEDC staff of district I, II and III on the challenges encountered in the distribution of electricity in Nigeria

| Groups    | N  | X   | SS  | df | MS | F_cal. | F_crit. | Decision    |
|-----------|----|-----|-----|----|----|--------|---------|-------------|
| District I| 198| 3.30| 0.74| 2  | 0.37| 0.87   | 1.96   | Not Rejected|
| District II| 202| 3.32| 225.04| 524| 0.43|        |         |             |
| District III| 127| 3.23| 225.78|    |     |        |         |             |
| Total     | 527|     |      |    |    |        |         |             |

F-crit. = F- critical, F-cal. = F-calculated, X = Mean, SD = Standard deviation, N = Sample, SS=Sum of Squares, MS= Mean Squares.

The results of the analysis of variance in Table 4 indicated that EEDC staff of district II had higher mean response (3.32) relative to the mean response of EEDC staff of district I (3.30) and EEDC staff of district III (3.23). The differences in the mean response was not significant at 0.05 level of significance calculated F-value (0.87) < table F-value (1.96). This shows that there was no significant difference in the mean response of EEDC from the three districts. Therefore the null hypothesis was retained.

**Hypothesis 2:** There is no significant difference in the mean response of EEDC staff of district I, II and III on the solutions proffered to the epileptic electricity supply in Nigeria

**Table 5:** Analysis of variance on the mean differences of the responses of EEDC staff of district I, II and III on the problem of electricity generation in Nigeria

| Groups    | N  | X   | SS  | df | MS | F_cal. | F_crit. | Decision    |
|-----------|----|-----|-----|----|----|--------|---------|-------------|
| District I| 198| 3.29| 1.08| 2  | 0.54| 1.62   | 1.96   | Not Rejected|
| District II| 202| 3.26| 175.84| 524| 0.34|        |         |             |
| District III| 127| 3.38| 176.92|    |     |        |         |             |
| Total     | 527|     |      |    |    |        |         |             |

F-crit. = F- critical, F-cal. = F-calculated, X = Mean, SD = Standard deviation, N = Sample, SS=Sum of Squares, MS= Mean Squares.

The results of the analysis of variance in Table 4 indicated that EEDC staff of district III had higher mean response (3.38) relative to the mean response of EEDC staff of district I (3.29) and EEDC staff of district II (3.26). The differences in the mean response was not significant at 0.05 level of significance (calculated F-value (1.62) < table F-value (1.96)). This shows that there was no significant difference in the mean response of EEDC from the three districts. Therefore the null hypothesis was not rejected.
4. Discussion
The study found out that systemic corruption is the major cause of insufficient electricity generation in Nigeria. It was due to the magnitude of damages it caused on the Nigerian electricity sector that prompted the need for its reform. Yet there are still claims of sharp practices in the form of embezzlement of funds right from the administration of President Olusegun Obasanjo to this present day privatization. The entire participants stated emphatically that: “corruption is the main problem slowing the progress of power sector in Nigeria. Government is to be blame for it. A lot of money in billions of dollar has been allocated into the power sector, but because of greed, they play politics with everything”. This finding is in consonant with the finding of [16] who found out that corruption and embezzlement is the key reason to the collapse of Nigerian electricity sector. The proceeds generated fraudulently by government resulted to a long-standing monopoly of the power sector.

The lack of energy mix is also another factor contributing to the problem of electricity generation in Nigeria. In a bid to still have some level of influence on the power systems, government gave blind eye to other options of power generation. And this has made the country to depend heavily on gas fired generating power systems which is currently not sufficient enough in meeting the demands of the Nigerian populace. In similar vein, other participants stated that: “over dependent of limited sources of power for a long time has killed the power sector of Nigeria. In other developed countries, they generate power from sources like wind, solar, and even nuclear. Nigeria population is growing faster than the existing generating capacity. Because of the non-diversification in power generation the problem will last for a long time. Supporting this finding, Etukudor et al. [6] reported that 88% of the total generating licenses are gas-fired power stations.

The problem of power generation is also linked to irregular gas supply to the power plant which has thwarted the capacity of the power plants resulting to under generation of electricity. Supporting this finding, [6, 16] established that a major issue in the Nigerian electricity generation is caused as a result of the irregularities in gas supply. Other impediments to electricity generation were tied to infrastructural degradation. This finding is in consonant with the findings of Etukudor et al. [6] who found out that generation inefficiency was due to aging plant infrastructure and the non-completion of integrated power project.

Despite the implemented reform in the Nigerian power sector, the sector is still faced with a number of challenges stretching from centralization of power systems, inadequate infrastructure such as transmission and distribution lines, over loaded transformers, lack of logistics facilities and metering as well as government policies and attitude of staff.

The practice of centralization of power systems still posed as a major challenge to electricity distribution and transmission in Nigeria. This is because, practices of this kind, require long lines of transmissible infrastructure. Which in most cases are either dilapidated or not available thereby denying some people access to power, as well as unreliable power to those that could not access it at all. Another infrastructural issue is reflected in the estimated billing system still practiced among distribution companies. A lot of households are yet to be metered which has resulted to improper account of energy supply by the distribution company. What this implies is that the energy unaccounted for will translate to incessant interruption of power supply in order
for the distribution company not to lose. This finding corroborates earlier report by Ohajianya et al. [17] who reported that the major cause of erratic power supply in Nigeria is energy wastage by consumers occasioned by default or estimated billing system adopted by power distribution companies.

In addition, lack of facilities such as vans for routine maintenance, and modern technology for communication and monitoring is responsible for the abysmal logistic. Further finding from the study also showed that government policies lack futuristic end. The uncertainties associated with government policies are discouraging for investors who intend to expand.

The study found out that the solutions to the erratic power supply lies strongly on the decentralization of power sector, formulation and implementation of policies that would allow a level playing ground for other sources of electricity generation and also, building capacity for local manufacturing and repairs of renewable power systems. That way, more players will be involve in the development and implementation of small scale renewable power systems most especially in the rural areas such as solar PVs, small wind turbines etc. This will complement the already existing power system thereby boosting energy generation that will mitigate the wide gap between supply and demand. Lastly, the study found out that funding, and government effective engagement would enable the sector thrives.

Analysis of variance of the response of EEDC staff of district I, II and III on the challenges encountered in the distribution of electricity in Nigeria indicated no significant difference at P > 0.05, as calculated F-value (0.87) was below table F-value (1.96). Thus hypothesis one was not rejected. Responses of EEDC staff of district I, II and III on the solutions proffered to the epileptic electricity supply in Nigeria also indicated no significant difference at P > 0.05, as calculated F-values (1.62) was below the table F-value of 1.96. Hence, hypotheses two were retained.

5. Conclusion
The implemented power sector reform has not made significant impact in meeting the energy demand of the populace. This is due to fact that the sector is filled with a number of emerging challenges such as corruption, infrastructural decay, and shortage of gas supply, inadequate facilities, political interference and inadequate policies for renewable energy. These challenges can be mitigated by policy consistency as well as continual review of policies in line with current state of things. Furthermore, government disengagement in wanton interference and increased investment in clean and renewable power generation.

6. Recommendations
- Government should demonstrate some degree of political willingness by formulating and implementing consistent policies that are necessary to improve on the reform and attract more local and foreign investors into the power sector. One key area in which such political will can be demonstrated is in providing leadership by example in the management of the transmission and distribution segment of the power sector value chain. That is not to say that government will be completely not involved, rather, government should ensure sustained investments in the sector since the transmissions and distributions companies remain under its watch.
• Government should invest in human capacity on local manufacturing of renewable energies, with emphasis on solar and hydro. This will go a long way in contributing to power generated, bringing energy supply closer to consumers and breaking the shackles of dependency on the insufficient existing power grid.

• A state of the art technology should be put in place for proper communication and monitoring of all transmission and distribution facilities. With this in place, will facilitate proper coordination, planning, engineering, and management of transmission and distribution of electricity.

• A legal financial committee that is transparent should be designated to monitor all funds allocated to the power sector as well as prosecute offenders.

• Government should formulate effective gas policy which allows gas to play a pivotal role in the power sector reform.

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