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# AN INTEGRATED STATISTICAL VARIANCE AND VIKOR METHODS FOR PRIORITISING POWER GENERATION PROBLEMS IN NIGERIA

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***ABSTRACT***

*The bedrock of industrialization of any nation is the supply of adequate and efficient electricity to power both homes and industries. However, electricity supply in Nigeria is grossly inadequate and inefficient, which has resulted in many local industries becoming moribund. The inadequate power supply is mainly due to power generation problems. Some of the problems identified include, among others lack of energy mix, militant activities and corruption. The purpose of this paper is to develop a tool for prioritizing these problems for power generation. Managers able to identify the more critical ones and allocate more resource in addressing them easily. Hence, this paper presents a tool based on the integration of statistical variance and Vlsekriterijumska Optimizacija Ikompromisno Resenje (VIKOR) and compromise solution methods for prioritization of the various problems confronting power generation in Nigeria. The statistical variance method is used in the decision criteria weights determination while the VIKOR method is used in the ranking of power generation problems. The proposed technique was demonstrated with data collected from experts. The result of the analysis showed that the most critical power generation challenge is the poor maintenance of power generation infrastructure.*

***KEYWORDS***: *Power generation problems; VIKOR method; statistical variance method; decision criteria*

## 1.0 INTRODUCTION

The key to industrialization of any nation is availability of adequate electricity to power residential buildings and industries. In Nigeria, the bodies entrusted with this responsibility produce electricity, which is grossly inadequate to power homes and industries of the most populous nation in Africa. The erratic and inadequate supply of electricity by these bodies is one of the major reason the nation had remained underdeveloped. Most industries now use individual electricity generators to power their machines, thereby resulting to increase in overhead cost and uncontrolled environmental pollution. Many of the industries had folded up as a result of the ever-increasing overhead cost while some had relocated to other countries.

The government is concerned with the epileptic power supply from the bodies entrusted with the assignment and have carried out various reforms at different times. The various reforms unfortunately had not yielded any positive result. Nigeria remains one of the

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lowest electricity consumption per capita in African (Olaoye et al., 2016) as shown in Table 1. For example, between the year 2010 and 2014, the electricity consumption per capita in Nigeria was 144 kWh, which was less than half of Ghana and less than five percent of South African electricity consumption per capita (World Bank, 2015). Although the power generation installed capacity is over 25,000 MW, the available capacity is below 5,000 MW as presented in Table 2. Some of the reasons attributed to the gap in the installed capacity and available capacity and in general poor power generation are militant activities, lack of energy mix, high level corruption and poor maintenance culture.

Table 1. Electricity consumption per capita in most African countries (World Bank, 2015)

| S/N | Countries | Electric consumption per capita (KWh) |
|---|---|---|
| 1 | Algeria | 1,362 |
| 2 | Angola | 344 |
| 3 | Benin | 97 |
| 4 | Botswana | 1,708 |
| 5 | Cameroon | 274 |
| 6 | Cote d ivoire | 281 |
| 7 | Congo Rep. | 213 |
| 8 | Congo Dem. Rep. | 107 |
| 9 | Egypt | 1,699 |
| 10 | Ethiopia | 70 |
| 11 | Ghana | 357 |
| 12 | Kenya | 171 |
| 13 | Libya | 1,841 |
| 14 | Morocco | 912 |
| 15 | Mozambique | 463 |
| 16 | Namibia | 1,564 |
| 17 | Niger | 52 |
| 18 | Nigeria | 144 |
| 19 | Senegal | 222 |
| 20 | South Africa | 4,229 |
| 21 | Tanzania | 100 |
| 22 | Tunisia | 1,446 |
| 23 | Zambia | 703 |
| 24 | Zimbabwe | 543 |
| 25 | Sub-Sahara Africa | 497 |

In the literature, different studies on power generation system have been carried by various researchers with respect to improve power generation challenges in Nigeria. Emovon et al. (2011) developed mathematical models for evaluating performance of Egbin thermal power station, Nigeria. Specifically, the models were developed for availability and reliability analysis of power plants. A mathematical model was also proposed for evaluating production losses due to system unavailability. In a similar research, Obodeh (2011) carried out an investigation on the performance of the Sapele thermal power station, Nigeria. Oyedepo et al., (2014) carried out performance and economic analysis of a gas turbine power plant in Nigeria. The performance was evaluated in terms of power outage cost as a result of plant downtime. The study revealed that revenue loss due to system downtime amount to $251 million. Aliyu (2013) utilized Long-range Energy Alternative Plan (LEAP) to simulate future energy expansion plan in Nigeria. Mohammed (2013) carried out a comprehensive review of four major kinds of renewable energy sources such as biomass, solar, wind and hydro. Adler (1980) presented a mathematical model for evaluating the probability of outages of a power generating plant. Olaoye et al. (2016) carried out investigations on the energy crisis in Nigeria. In the paper, the authors discussed the potentials of renewable energy and the need to harness it to come out of the energy crisis.

From the above review, it is obvious that most of the research in literature mainly dwells on reliability and performance analysis of power generation system. However, in this paper, a tool for prioritizing the various challenges confronting power generation in Nigeria is presented. The tool utilizes a combination of statistical variance method and VIKOR method. The statistical variance method is used in the determination of the weights of decision criteria whilst utilizing the VIKOR method in the ranking of the power generation problems. The tool will assist government and power generation managers in prioritizing power challenges to allocate the bulk of the insufficient resources available for power infrastructure development to the more critical ones for greater power output.

## 2.0 POWER GENERATION PROBLEMS IN NIGERIA

One of the major barriers to economic growth in Nigeria is the erratic power supply of the bodies entrusted with the generation, transmission and distribution of power. The reason for the erratic supply of electricity to power industrial and residential machines are numerous and diverse. Militant activities have left power generation facilities damaged to pipelines that supply gas to the power station for electricity generation. The Nigerian power sector just like the down dream sector of the oil industry has suffered badly from poor maintenance problem. The power sector, which is regulated by the Power Holding Company of Nigeria (PHCN) has been poorly funded to the extent that many of the power stations are unable to carry out maintenance programs resulting to plant units' ruin (Ayankola, 2009).

To overcome these problems, the three criteria, which are environmental pollution (EP), critical power assets damage (CAD) and power generation output (PGD), are adopted as described in Table 3. They are chosen because each of the power generation problem may result in environmental pollution, critical power asset damage and reduction in power generation output. For example, militant activities such as gas pipeline vandalism can destroy the ecosystem apart from having a negative impact on power generation output. Also, the issue of poor maintenance can cause catastrophic damage to critical power equipment or asset. These criteria are taught to be able to solve the different problems affecting power generation in Nigeria, as presented in Table 4. The different problems are prioritized based on the three decision criteria.

Table 2. Bodies entrusted with power generation by Government of Nigeria & generation capacity (Olaoye et al., 2016)

| S/N | Power generation company | Location | Type | Installed capacity | Capacity available |
|---|---|---|---|---|---|
| 1 | AES Nigeria Barge Ltd | | Thermal | 270 | 224 |
| 2 | Afam Power PLC | Afam, Rivers State | Thermal | 987.2 | 60 |
| 3 | Agbara Shoreline Power Ltd | Agbara, Ogun State | Thermal | 100 | |
| 4 | Alaoji Generation Company Ltd | Alaoji, Abia State | Thermal | 1074 | |
| 5 | Anita Energy Ltd | Agbara, Lagos State | Thermal | 90 | |
| 6 | Azura Power West Africa Ltd | Ihovor, Benin, Edo state | Thermal | 450 | |
| 7 | Benin Generation Company Ltd | Ihonvor, Edo state | Thermal | 450 | |
| 8 | Calabar Generation Company Ltd | Calabar, Cross River State | Thermal | 561 | |
| 9 | Century Power Generation Ltd | Okija, Anambra State | Thermal | 495 | |
| 10 | Enersys Nigeria Ltd | Ado, Ekiti State | Thermal | 10 | |
| 11 | Delta Electric Power Ltd | Oghareki, Delta State | Thermal | 116 | |
| 12 | DIL Power PLC | Obajana, Kogi State | Thermal | 135 | |
| 13 | Egbema Generation Company Ltd | Egbema, Imo State | Thermal | 338 | |
| 14 | Egbin Power PLC | Egbin, Lagos State | Thermal | 1320 | 1100 |
| 15 | NEGRIS | Ikorodu, Lagos State | Thermal | 140 | |
| 16 | Ethiope Energy Ltd | Ogorode, Delta State | Thermal | 2800 | 300 |
| 17 | Farm Electric supply Ltd | Ota, Ogun State | Thermal | 150 | |
| 18 | First Independent Power Company Ltd | Omoku, Rivers State | Thermal | 150 | 60 |
| 19 | First Independent Power Company Ltd | Trans Amadi, Rivers State | Thermal | 136 | |
| 20 | First Independent Power Company Ltd | Eleme, Rivers State | Thermal | 95 | |
| 21 | Fortune Electric Power Company Ltd | Odukpari, Cross River State | Thermal | 500 | |
| 22 | Gbarain Generation Company Ltd | Gbarain, Bayelsa State | Thermal | 225 | |
| 23 | Geometric Power Ltd | Aba, Abia State | Thermal | 140 | 140 |
| 24 | Geregu Power PLC | Geregu, Kogi State | Thermal | 414 | 276 |
| 25 | Hudso Power Ltd | Warawa, Ogun State | Thermal | 150 | |
| 26 | Ibafo Power Station | Ibafo, Ogun State | Thermal | 200 | |
| 27 | Ibom Power Ltd | Ikot Abasi, Akwa Ibom State | Thermal | 190 | |
| 28 | ICS Power Ltd | Alaoji, Abia State | Thermal | 624 | |
| 29 | Isolo Power Generation Ltd | Isolo, Lagos State | Thermal | 20 | |
| 30 | JBS wind power Ltd | Mangu, Plateau State | Wind | 100 | |
| 31 | Kainji Hydro Electric PLC | Kainji, Niger State | Hydro | 760 | 450 |
| 32 | Kainji Hydro Electric PLC | Jebba, Niger State | Hydro | 540 | 450 |
| 33 | Knox J and L Energy solution Ltd | Ajaokuta, Kogi State | Thermal | 1000 | |
| 34 | Lotus and Bresson Nigeria Ltd | Magboro, Ogun State | Thermal | 60 | |
| 35 | MBH Ltd | Ikorodu, Lagos State | Thermal | 300 | |
| 36 | Minaj Holdings Ltd | Agu-Amorji, Enugu State | Thermal | 115 | |
| 37 | Nigeria Agip oil Ltd | Okpai, Delta State | Thermal | 480 | 361 |
| 38 | NESCO | Bukuru, Plateau State | Thermal | 30 | |
| 39 | Notore Power Ltd | Onne, Rivers State | Thermal | 50 | |
| 40 | Ogorode Generation Company Ltd | Ogorode, Delta State | Thermal | 450 | |
| 41 | Olorunsogo Generation Compay Ltd | Olorunsogo, Ogun State | Thermal | 750 | |
| 42 | Olorunsogo Power PLC | Olorunsogo, Ogun State | Thermal | 335 | 76 |

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|---|---|---|---|---|---|
| 43 | Omoku Generation Company Ltd | Omoku, Rivers State | Thermal | 250 | 60 |
| 44 | Omotosho Generation Company Ltd | Omotosho II, Ondo State | Thermal | 500 | 76 |
| 45 | Omotosho Power PLC | Omotosho, Ogun State | Thermal | 335 | 35 |
| 46 | Paras Energy and natural Resources Dev. Ltd | Ogijo, Ogun State | Thermal | 96 | |
| 47 | Sapele Power PLC | Sapele, Delta State | Thermal | 1020 | 90 |
| 48 | Shell Petroleum Dev. Compay Ltd | Afam VI, Rivers State | Thermal | 642 | 450 |
| 49 | Shiroro Hydro Electric Ltd | Shiroro, Niger State | Hydro | 600 | 450 |
| 50 | Supertek Electric PLC | Ajaokuta, Kogi State | Thermal | 500 | |
| 51 | Supertek Nigeria PLC | Akwete, Abia State | Thermal | 1000 | |
| 51 | Ughelli Power PLC | Ughelli, Delta State | Thermal | 942 | 320 |
| 52 | Western Technologies and Energy Services Ltd | Sagamu, Ogun State | Thermal | 1000 | |
| 53 | Zuma Energy Nigeria Ltd (Gas) | Ohaji Egbema, Imo State | Thermal | 400 | |
| 54 | Zuma Nigeria Ltd (Coal) | Itobe, Kogi State | Thermal | 1200 | |
| | TOTAL | | | 25, 255.2 | 4,978 |

Table 3. Decision criteria

| **S/N** | **Decision criteria** | **Description** |
|---|---|---|
| 1 | Environmental pollution (EP) | Power problems can pollute the environment diversely. For example, militant activities cause physical damages to thermal power station gas pipeline and invariably pollute the environment. The most critical power generation problem is the one whose effect pollute the environment the most |
| 2 | Critical power asset damage (CAD) | Equipment for power generation can be damaged due to power problems and the one with the greater effect is the most critical |
| 3 | Power generation output (PGO) | Power generation can be hampered by power problems, thereby resulting in reduction in generated power. The problem that will impact more negatively is the most critical |

Table 4. Power generation problems

| S/N | Power generation problem | Description |
|---|---|---|
| 1 | Poor maintenance | The right maintenance approach not being utilized for maintenance of power generation equipment's. They react to failure in most cases rather than being proactive |
| 2 | Corruption | Power generation managers mismanage resources allocated for power improvement |
| 3 | Inadequate funding | Inadequate fund to purchase modern equipment and maintain existing infrastructure |
| 4 | Militant activities | Pipeline which supply gas to most thermal power station is deliberately being vandalized by Militant |
| 5 | Inadequate manpower | Technical manpower for operating and maintenance of power equipment at optimal level is either lacking or inadequate. |
| 6 | Wrong location | Location of power station far from sources of human capacity and energy due to nepotism and ethnicity |
| 7 | Drought | Little or no rain which adversely affect hydro power generation |
| 8 | Poor electricity pricing | Electricity customers' inability to pay for the actual value of electricity due to poverty forcing power distributors to charge less. |
| 9 | Lack of policy continuity | Different successive Government coming on board with different policies instead of building on good policy of their predecessors. |

## 3.0 METHODOLOGY

### 3.1 Criteria weighting tool: Statistical variance method

Criteria weighting is an important factor in prioritizing power generation problems because of its impact in the final ranking of the different power problems. In the literature, many approaches have been applied in evaluating weights of criteria. The application of an objective technique such as the statistical variance method has been reported in literature (Rao & Patel, 2010; Nirmal, 2013). A subjective technique such as Analytic Hierarchy Process (AHP) and Points method have also been applied (Rao, 2008). The statistical variance method was chosen in this paper because it is an objective method of criteria weights determination, thereby reducing personal bias in the overall decision making process.

The variance method steps are as follows (Rao and Patel, 2010):

1. Formation of the decision matrix.
   The decision matrix is formed as shown in Equation (1):

$$P = \left(\overline{p}_{ij}\right)_{m.n} \tag{1}$$

2. The decision matrix normalization.
   The normalization of the decision matrix is as given in Equation (2):

$$y_{ij} = \frac{\overline{p}_{ij}}{\sum_{i=1}^{m} \overline{p}_{ij}} \ , \qquad i = 1,2, \dots, m; \quad j = 1,2, \dots, n \tag{2}$$

where $y_{ij}$ is the normalized matrix.

3. The variance of each risk criterion is evaluated as given in Equation (3):

$$V_j = \frac{1}{m}\left[\sum_{i}^{m}\left(y_{ij} - \overline{y}_{ij}\right)^2\right] \tag{3}$$

where $\overline{y}_{ij}$ is the mean value of $y_{ij}$ and $V_j$ is the variance of each risk criterion.

4. The weight of each decision criterion is evaluated as given in Equation (4):

$$w_j = \frac{V_j}{\sum_{j}^{n} V_j} \tag{4}$$

where $w_j$ is the weight of each criterion.

### 3.2 Ranking tool: VIKOR Method

The VIKOR method is a multi-criteria decision making tool which selects a compromise solution from a set of options with reference to decision criteria. The compromise solution is attained using a ranking index based on a measure of closeness to the positive ideal solution. The technique was developed in 1979 by Opricovic (1998). The VIKOR method has been applied in solving various multi-criteria decision making problems by some authors (Liu et al., 2013 ; Chatterjee et al., 2009 ; Rao, 2008 ; Çalişkan et al., 2013 ; Anojkumar et al., 2014). Other description of the VIKOR method can be referred to the work by Opricovic (1998) and Opricovic & Tzeng (2004).

The VIKOR methodology steps are as follow (Çalişkan et al., 2013, Emovon, et al, 2015):

1. Determination of the best and worst values for each criterion.

With reference to the decision matrix in Equation (5), the best and worst values for each criterion are determined as:

$$\overline{p}_j^{\,+} = \max_i \overline{p}_{ij}, \quad \overline{p}_j^{\,-} = \min_i \overline{p}_{ij} \tag{5}$$

where, $\overline{p}_j^{\,+}$ is the best value for the $j^{th}$ criterion, and
$\overline{p}_j^{\,-}$ is the worst value for the $j^{th}$ criterion.

2. Evaluation of the utility measure and regret measure for each power generation problem is as given in Equations (6) and (7):

$$S_i = \sum_{j=1}^{n} w_j \left(\overline{p}_j^{\,+} - \overline{p}_{ij}\right) / \left(\overline{p}_j^{\,+} - \overline{p}_j^{\,-}\right) \tag{6}$$

$$R_i = \max_j \left[ w_j \left(\overline{p}_j^{\,+} - \overline{p}_{ij}\right) / \left(\overline{p}_j^{\,+} - \overline{p}_j^{\,-}\right) \right] \tag{7}$$

where
$w_j$ is the weight of $j^{th}$ criterion
$S_i$ is the utility measure
$R_i$ is the regret measure

3. Calculation of the VIKOR index value $Q_i$, as given in Equation (8):

$$Q_i = v\,(S_i - S^+)/(S^- - S^+) + (1 - v)(R_i - R^+)\,/(R^- - R^+) \tag{8}$$

where

$$S^+ = \max_i [(S_i)\,, \qquad i = 1,2, \dots, m]$$

$$S^- = \min_i [(S_i)\,, \qquad i = 1,2, \dots, m]$$

$$R^{+} = \max_{i}[(R_i)\,, \qquad i = 1,2,\dots,m]$$

$$R^{-} = \min_{i}[(R_i)\,, \qquad i = 1,2,\dots,m]$$

$v$ represents the weight of the decision-making strategy of the maximum group utility whose values varies from 0 to 1. If $v$ is set at 1, it is a decision-making process that utilizes a strategy of maximum group utility and if set at 0, a decision-making process that utilizes a strategy of minimum regret (Kuo et al., 2015). In this paper, $v$ is set at 0.5 because it is generally set at this value according to (Çalişkan et al., 2013) and this is due to the fact that most decision making process involves both maximum group utility and individual regret (Kuo et al., 2015).

4. The ranking of power generation problems is based on the VIKOR index value, $Q_i$, and the smaller the value the better the rank.

## 4.0 DATA COLLECTION AND ANALYSIS

### 4.1. Data collection

Data for evaluating and prioritizing the power generation problems with respect to three decision criteria were obtained using experts' opinions. Two experts rated the power generation problems utilizing a questionnaire developed based on 5-point Likert scale. The individual experts' rating was averaged and results are presented in Table 5. The information in Table 5 were then applied as input data into the VIKOR method for the final ranking of the power generation problems.

Table 5. Expert average rating of power generation problems (decision matrix)

| S/N | Power generation problems | EP | CAD | PGO |
|---|---|---|---|---|
| 1 | Poor maintenance | 2.5 | 5 | 5 |
| 2 | Corruption | 2 | 3 | 5 |
| 3 | Inadequate funding | 2.5 | 3.5 | 4 |
| 4 | Militant activities | 4 | 3.5 | 4 |
| 5 | Inadequate manpower | 3 | 3 | 3 |
| 6 | Wrong location | 3 | 2 | 3 |
| 7 | Drought | 1 | 1 | 2 |
| 8 | Poor pricing of electricity | 2 | 2.5 | 1.5 |
| 9 | Lack of policy continuity | 1.5 | 3 | 3 |

### 4.2 Data Analysis

#### 4.2.1 Decision criteria weights determination

Having obtained the decision matrix in Table 5, the next step was to determine the weights of decision criteria. To achieve this aim, firstly, the decision matrix was normalized using Equation (2) and the results are presented in Table 6. Following this, the statistical variance of each decision criterion was evaluated using Equation (3) on information in Table 6. Finally, the weight of each decision criterion was evaluated using Equation (4) and the results are presented in Table 7.

Table 6. Normalized decision matrix

| Power generation problem | EP | CAD | PGO |
|---|---|---|---|
| 1 | 0.5392 | 1.0783 | 1.0783 |
| 2 | 0.4313 | 0.5828 | 0.9054 |
| 3 | 0.5392 | 0.6799 | 0.7243 |
| 4 | 0.8627 | 0.6799 | 0.7243 |
| 5 | 0.6470 | 0.5828 | 0.5432 |
| 6 | 0.6470 | 0.3885 | 0.5432 |
| 7 | 0.2157 | 0.1943 | 0.3621 |
| 8 | 0.4313 | 0.4856 | 0.2716 |
| 9 | 0.3235 | 0.5828 | 0.5432 |

Table 7. Decision criteria weights

| Decision criteria | Weights |
|---|---|
| EP | 0.2477 |
| CAD | 0.3455 |
| PGO | 0.4068 |

### 4.2.2 Ranking of power generation problems.

The weights of EP, CAD and PGO obtained in Section 4.2.1 together with the decision matrix in Table 5 were then applied as input data for the VIKOR technique for the final ranking of power generation problems. The first step in the VIKOR analysis was the determination of the best and worst values for each criterion which was achieved by applying Equation (5) to the decision matrix in Table 5. The results obtained are presented in Table 8. The utility and regret measure for each power generation problems were then evaluated using Equations (6) and (7) respectively, and results are presented in Table 9. Finally, based on which power generation problems, VIKOR index is ranked, using Equation (8) on Table 9 and the results are presented in Table 10.

Table 8. Best and worst value

| Decision criteria | Worst value | Best value |
|---|---|---|
| EP | 1 | 4 |
| CAD | 1 | 5 |
| PGO | 1.5 | 5 |

Table 9. Regret measure, utility measure and VIKOR index

| S/N | Power generation problems | Si | Ri |
|---|---|---|---|
| 1 | Poor maintenance | 0.0000 | 0.0000 |
| 2 | Corruption | 0.1382 | 0.1103 |
| 3 | Inadequate funding | 0.1493 | 0.0129 |
| 4 | Militant activities | 0.0693 | 0.0129 |
| 5 | Inadequate manpower | 0.2162 | 0.1794 |
| 6 | Wrong location | 0.2719 | 0.3051 |
| 7 | Drought | 0.5000 | 0.5000 |
| 8 | Poor pricing of electricity | 0.5237 | 0.5237 |
| 9 | Lack of policy continuity | 0.1861 | 0.1861 |

Table 10. Power generation problem VIKOR index and rank

| S/N | Power generation problems | $Q_i$ | Rank $Q_i$ |
|---|---|---|---|
| 1 | Poor maintenance | 0.0000 | 1 |
| 2 | Corruption | 0.2485 | 4 |
| 3 | Inadequate funding | 0.1621 | 3 |
| 4 | Militant activities | 0.0822 | 2 |
| 5 | Inadequate manpower | 0.3956 | 5 |
| 6 | Wrong location | 0.5770 | 7 |
| 7 | Drought | 1.0000 | 9 |
| 8 | Poor pricing of electricity | 0.9196 | 8 |
| 9 | Lack of policy continuity | 0.4823 | 6 |

From Table 10, it is obvious that the most critical challenge confronting power generation in Nigeria is the poor maintenance of power infrastructure having the lowest VIKOR index of 0. Militant activities are ranked second with a VIKOR index of 0.0822 and as such the second most critical challenge confronting power generation. The last challenge is the problem of drought having rank in the last position. The tool utilized in the ranking of power generation problems requires less computational effort than similar Multi-Criteria Decision Making (MCDM) tools such as the TOPSIS method (Nirmal, 2013; Rao, 2008 ; Carpinelli et al., 2014). Moreover, the limitation of the MCDM tool such as TOPSIS technique which has inability to consider the relative distance from the positive ideal and negative ideal solutions may be addressed through the VIKOR method (Anojkumar et al., 2014).

## 5.0 CONCLUSION

The inadequate and erratic supply of electricity to residential home and industries is the main reason Nigeria is grossly underdeveloped. Despite concerted effort made by successive government to reverse this ugly trend, Nigeria is still one of the lowest electricity consumptions per capita in Africa. In this research, a tool for prioritizing the various problems affecting the power generation in Nigeria is presented. The tool uses an integrated statistical variance method and VIKOR method for the ranking of different power generation problems based on three decision criteria. To demonstrate the suitability of the tool, data were obtained via expert opinion and analyzed. The result of the analysis revealed that poor maintenance of power equipment is the most critical problem confronting power generation in Nigeria. This research will stimulate Federal Government of Nigeria as a matter of urgency to declare a state of emergency with respect to proactive maintenance of power generation infrastructure across the Country. The proposed tool will also be useful to other nations in prioritizing power generation problems and other related challenges.

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