



Original Research Article

Assessment of Electricity Status in Nigeria from 2015 to 2017

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ABSTRACT

The impacts of stable power supply in the economic growth and wellbeing of a nation are enormous. Stable power supply enhances industrialization as well as technological advancement which are paramount in developing countries. But most of these developing countries which Nigeria is not an exception are still faced with frequent outages leading to disruption in the lives of her citizenry. This study is focused on analyzing the electricity status in Nigeria from 2015 to 2017 with a view to recommending a practicable solution to revamping the power sector that is posing a huge limitation to our long desired economic development. The results show that the highest daily peak generation occurred on the 2nd of February 2016 with 5074.70 MW, while the least occurred on the 6th of March 2016 with 3156.40 MW. The highest average energy generated occurred on the 2nd of February 2016 with 4697.55 MW, while the least occurred on the 6th of March 2016 with 2918.50 MW. The highest instantaneous energy delivered within the study period was 4557.167 MW H/H which occurred on 2nd of February 2016 and the lowest was 2774.107 MW H/H which occurred on 6th of March 2016. Moreover, in comparing the energy generated and energy delivered at load centers, it was evident that a great gap over 5% existed between them.

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1. INTRODUCTION

Issues regarding frequent power outage in Nigeria have today become a major concern in the nation. Many fear that the current state of power sector in the country might be a key setback to her economic development. Any country which cannot provide a cheap, stable and reliable power supply for her citizens is positioned to fail (Norbert, 2016). The frequent outages emanating from poor system infrastructure, generation, faults and vandalism have not only jeopardized the system's security, reliability, availability of services, increased loss of revenue, but has also become a source of national embarrassment.

It is important to emphasize that industrialization and growth rate of any country depend on energy available in that country, and the extent to which this energy is utilized (Borok et al., 2013). As a matter of fact, sustainable energy involves the provision of energy services in a reliable manner, which in turn necessitates that energy services be provided for all people in ways that, now and in the future, are sufficient to provide the basic necessities, affordable, not detrimental to the environment, and acceptable to communities and people (Oyedepo, 2012). In relation to the foregoing, sustainable energy supply is imperative in revamping the currently dwindling Nigerian economy that is characterized by high inflation.

The current status of electricity generated in Nigeria with regard to its population is grossly inadequate (Awosope, 2014). Furthermore, electricity generation, transmission and distribution in Nigeria accounts for less than one percent (<1%) of her GDP (Olaoye et al., 2016). This ill situation has existed for decades now.

Moreover, in many countries, achieving sustainable energy has proved difficult and, in some cases, especially in Africa countries, almost impossible (Emodi and Kyung-Jin, 2015). Thus, for achieving reliable, stable, effective, efficient and sustainable development, Nigeria needs to significantly increase the supply of modern and affordable energy services to all her citizens while, at the same time, maintaining environmental integrity and social cohesion (Oyedepo 2012).

Although the concept of Electricity Status in Nigeria has been treated extensively by many literatures, but there still exists a gap in recommending a practicable panacea to revamping the currently dwindling power sector that is posing a huge limitation to our long desired economic development. Hence, this paper provides a solution to this problem by proposing a 'mixed energy brand', the mix of the conventional non-renewable and a renewable source of energy generation can be the solution to the dwindling power sector.

2. MATERIALS AND METHODS

2.1. Materials

The materials used for this work include:

- Data showing peak and average energy generated by generating stations, peak and average energy demanded from load centers and transmission losses as contained in the National Control Center and Renewable Energy Master Plan Report
- Microsoft Office Excel was used to interpreted all the sourced for this research.

2.2. Methods

By plotting graphs and producing bar chats with data obtained, this research work investigates, evaluates and analyzes the present electricity status in Nigeria by using pass data collected. The data for this research covers a period of three years (2015 to 2017).

3. RESULTS AND DISCUSSION

Using data from National Control Center and Renewable Energy Master Plan Report the Nigerian electricity peak generation over a period of three years is presented in a bar chat. The peak and average energy generated by the plants in Nigeria from June, 2015 to February, 2017 are given in Figures 1 and 2 respectively.

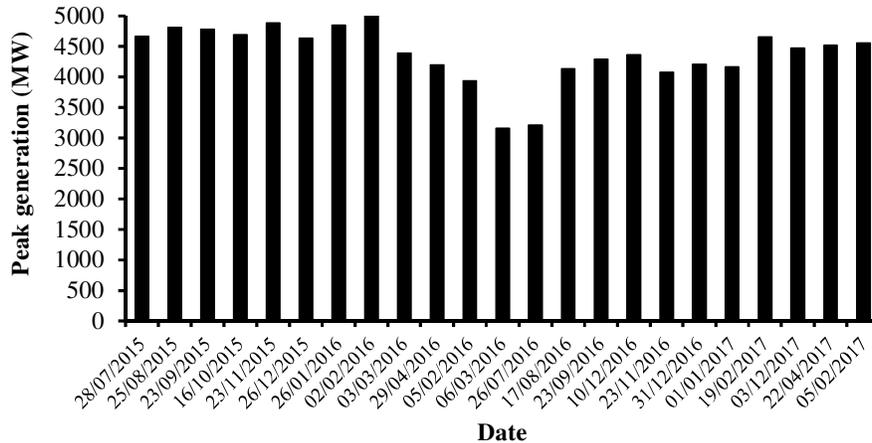


Figure 1: Nigerian peak generation from 2015 to 2017

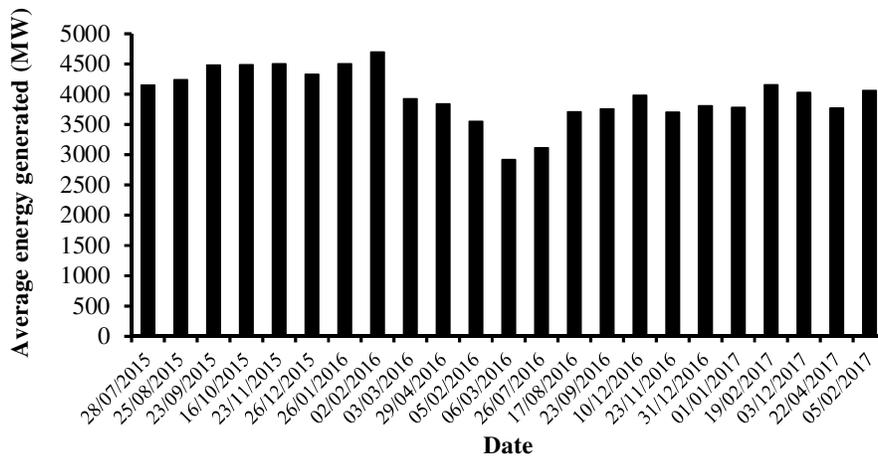


Figure 2: Nigerian average energy generation from 2015 to 2017

Throughout this study period, the peak generation fluctuated from one level to the other with significant shortfall. This inconsistency in generation shows the frequency of breakdown and collapse in the generation plants. The dip in power generation noticed especially during the dry season (February to April) in the year under review was mainly due to the drop in water volume available for the hydro turbines. Other decline in power generation may be as a result of shortage in gas supply to gas turbine power and combined cycle power plants. The peak power observed during times like July, August and other periods during the raining season should be associated with the high volume of water available for the dams during such periods. Periods of high power generation noticed during the dry seasons are mainly as a result the high natural gas exploration in the Niger Delta region of the country thereby increasing power generation of gas and thermal power stations located in the region.

The highest of these peaks occurred on the 2nd of February 2016 with 5074.70 MW, while the least occurred on the 6th of March 2016 with 3156.40 MW. Also, it seen from the result that the highest average energy generated within this study period occurred on the 2nd of February 2016 with 4697.55 MW, while the least occurred on the 6th of March 2016 with 2918.50 MW.

The details of energy sent out by Generation companies (GENCOs) from 7th June, 2015 to 5th February, 2017 is shown in Figure 3.

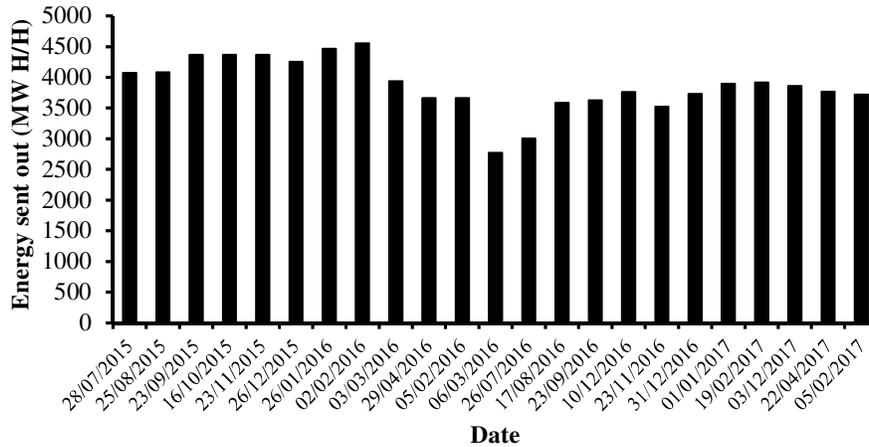


Figure 3: Energy sent out (MW H/H) profile in Nigeria from 2015 to 2017

It is clear from the results that energy evacuation within the study period is averagely poor, and unpredictable. The highest instantaneous energy evacuated within the study period was 4557.167 MW H/H which occurred on 02/02/2016 and the lowest was 2774.107 MW H/H which occurred on 06/03/2016. In comparing the peak generation, energy generated and energy delivered, it is evident that a great gap exists between Electricity generation and distribution in Nigeria. Throughout this study period there was never a time a tolerable difference existed between Energy generated and energy sent out, the least was above 145 MW (5%) apart.

Figure 4 shows the amount of power lost in the course of transmitting power generated from the GENCOs to transmission load centers.

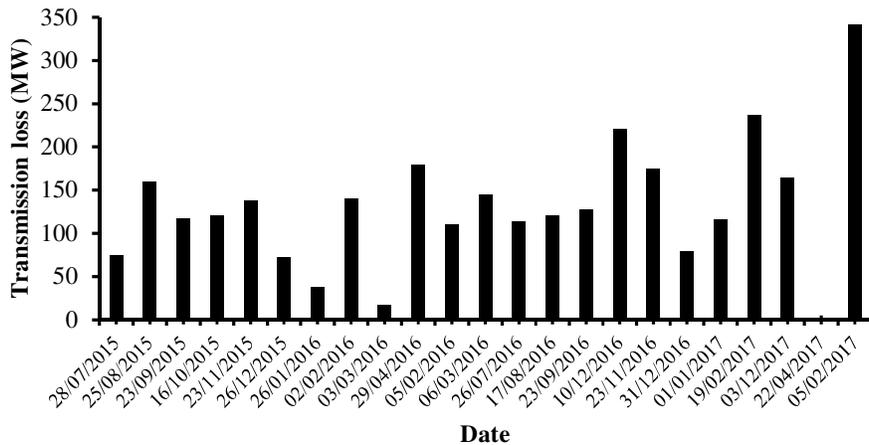


Figure 4: Transmission loss (MW) from 2015 to 2017

The highest loss (345.86 MW) occurred on 05/02/2017, while the least (3.2 MW) which appears quite infinitesimal occurred on 22/04/2017. Hence, it can be deduced from the result that the highest energy

evacuation within the study period only occurred on 05/02/2017 with a near 97% evacuation of the corresponding total energy generated.

A comparison between the peak and minimum power generation of all the generating plants in the Nigeria power grid and the comparison of the maximum and minimum power delivered at load centers are shown in the bar chats in Figures 5 and 6.

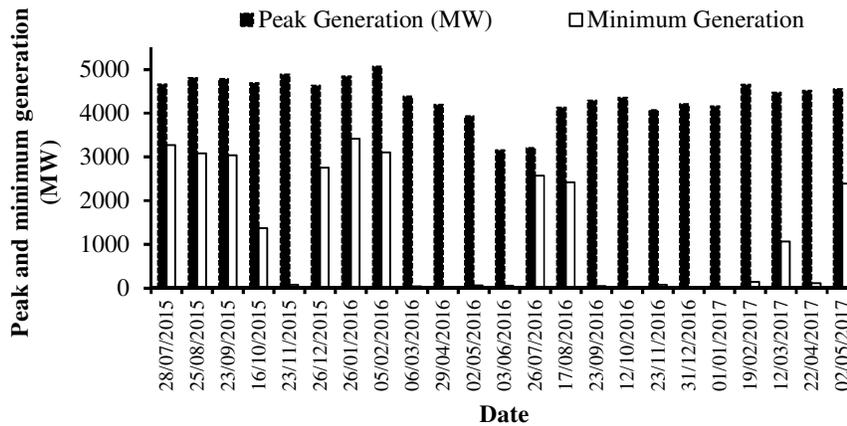


Figure 5: Nigerian power generation profile from 2015 to 2017

Figure 5 shows in details the rise and fall of power generation in Nigeria within the three years study period. From the result, it is obvious that the disparity in generation level is alarming and not healthy for a growing economy like Nigeria.

Figure 6 shows the level of disproportion in energy evacuation from the GENCOs in Nigeria within a three year study period. Nigeria is very far from the minimum electric power she needs for infrastructural, economical, technological (etc.) developments, which should be a minimum of 160,000 MW. Hence, there should be an urgent alternative power generating means that is not as expensive and cumbersome in setting up as the conventional hydro, gas turbine and thermal power generation plants commonly used in Nigeria.

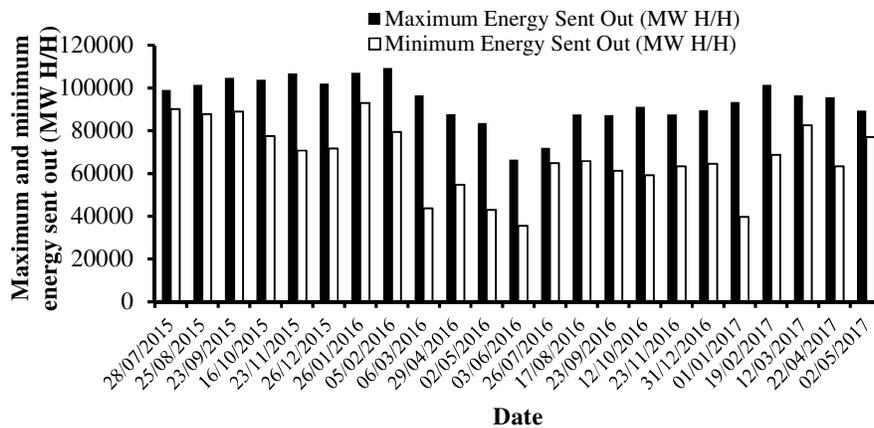


Figure 6: Energy evacuation profile in Nigeria from 2015 to 2017

4. CONCLUSION

In this research, the Nigerian Electricity Status has been examined from 2015 to 2017. The peak generation showed frequently swing from one level to other with significant shortfalls. The highest of the daily peak generation within this three year study period occurred on the 2nd of February 2016 with 5074.70 MW, while the least occurred on the 6th of March 2016 with 3156.40 MW. Also, from the average energy generation profile, it is evident that the highest energy generated within this study period occurred on the 2nd of February 2016 with 4697.55 MW, while the least occurred on the 6th of March 2016 with 2918.50 MW. More so, the highest instantaneous energy evacuated within the study period was 4557.167 MW H/H which occurred on 02/02/2016 and the lowest was 2774.107 MW H/H which occurred on 06/03/2016. Moreover, in comparing the Peak generation, Energy generated and Energy sent out, it is evident that a great gap exists between electricity generation and distribution in Nigeria.

5. CONFLICT OF INTEREST

There is no conflict of interest associated with this work.

REFERENCES

- Akuru U. B and Okoro O.I (2014). Renewable energy investment in Nigeria: A review of the Renewable Energy Master Plan. *Journal of Energy in Southern Africa*, 25(3), pp. 67-73.
- Awosope, C. A. (2014). Nigeria Electricity Industry: Issues Challenge and Solutions. Covenant University 38th Public Lecture, pp 1-40.
- Borok, M. I., Agontu J. A. and Mangai, M. M. (2013). Energy Security in Nigeria: Challenges and Way Forward. *International Journal of Engineering Science Invention*, 3(2), pp. 1-6.
- Emodi, N. V. and Kyung-Jin, B. (2015). Sustainable Energy Development in Nigeria: Current Status and Policy Options. *Renewable and Sustainable Energy Reviews*, 51(C), pp. 356-381.
- Norbert, E. (2016). On the path to sustainability: Key Issues on Nigeria's Sustainable Energy Development. Elsevier: Energy Report 2, pp. 28-34.
- Olaoye, T., Ajilore, T., Akinluwade, K., Omole, F. and Adetunji, A. (2016). Energy Crisis in Nigeria: Need for Renewable Energy Mix. *American Journal of Electrical and Electronic Engineering*, 4(1), pp. 1-8.
- Oyedepo, S. O. (2012). Energy and Sustainable Development in Nigeria: The way forward. *Energy, Sustainability and Society: Springer Open Journal*, 6(3), pp. 1-17.