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ASSESSMENT OF RURAL ELECTRIFICATION LEVEL IN EKITI STATE, SOUTHWEST NIGERIA

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ABSTRACT

The electricity access in Nigeria is about 40%. The rural areas in the country when they have more than 70% access will improve the Electricity access in the country. The method used in this paper is the Bus incidence matrix method. The use of simple algorithm to determine the level of electrification in each local government in the state The algorithm put the level of electrification at 17.44%. Recommendations were made on approach of improving the level of electrification in Ekiti State, Southwest Nigeria.

KEYWORDS: Access, Bus Incidence, Electrification, Grid, Rural

INTRODUCTION

Rural electrification is the process of bringing electrical power to rural and remote areas. Electricity is used for lightning, household purposes and allows for mechanization of farm operations. At least a billion people worldwide still lack house hold electric power [1]. Rural electrification is a global challenge in the developing countries and the problems are acute in Nigeria, because of inadequacy of power supply to the consumers [2].

Reliable and affordable electricity supply will help rural households to devote less time and income to procuring energy supply. Energy access in rural areas can have a significant impact on the quality of health services, education and access to information and communication technology. Rural electrification is critical to the socio-economic development of rural areas of any nation of the world [3, 4]. 60% of Nigeria`s population an equivalent estimated 15.3 million households in the country are not connected to National grid [5]. Rural electrification infrastructure in Nigeria is weak and dilapidated form anywhere they exist in the country [6].

The Nigeria rural electrification started in 1981 with the advent of National Rural Electrification Programme (NREP) which was carried out by National Electric Power Authority (NEPA). The target was to connect the headquarters of all the 774 local government Areas (LGEA) to the grid system. The programme was able to connect 600 LGEAs to the National grid. It is obvious that majority of Nigerians have no access to electricity and the supply to those with access is erratic [7]. The bus incidence matrix depicts the incidence of elements to the busses in the graph of a network. The element of aip of the bus incidence matrix is +1, -1and o with flow of power into a node in the same direction, power flow out of a node in different direction and no interconnection between different nodes[8].

Table 1: Type of Main Lightning Fuel by Regular Households in Percentage

Areas	Total Firewood Used	Grass	Kerosene	Electricity	Gas	Battery	Candle	Other Means
Urban	4.10	0.40	32.80	57.20	0.20	3.60	0.40	1.20
Rural	13.10	0.70	41.30	20.00	0.10	19.60	0.90	4.20
NGA	9.60	0.60	38.00	34.70	0.10	13.60	0.70	3.0

Source: Akpojedje. et al. 2016.

Major problems identified by rural households in Nigeria are: Water at 77%, Electricity at 53%, Poverty at 46%, Helathcare at 40%, Roads at 26%, Education at 22%, Fertilizer at 22%, and at 19%. [9]

Methodology

Records of number of communities in each LGA, number of electrified communities were obtained from development of Research and Statistics (2004). These data were used to estimate the level of electrification in Ekiti State. The algorithm for the implementation is as:

Let

The number of communities in i_{th} LGA be NOC_i

The number of Electrified communities be NEC_i

The level of electrification LE_i in the i^{th} LGA can be measured in equ 1:1

$$LE_i = \frac{NEC_i}{NOC_i} \times 100\% \quad 1.1$$

Let the total number of communities in the state be TOC. The relative level of electrification of each LGA, RLE_i will be given as

$$RLE_i = \frac{NEC_i}{TOC_i} \times 100\% \quad 1.2$$

Level of electrification in the state (SLE) is represented by equation 1.3.

$$SLE = \sum_{i=1}^{16} RLE_i \quad 1.3$$

Equation 1.3 can be re-written as 1.4

$$SLE = \frac{1}{TOC} \sum_{i=1}^{16} LE_i \qquad X\ NOC_i \quad 1.4$$

Table 2: The Results Are Presented in Table 2

Lgas	No of Communities	LGA (I)	Level of Electrification (%)	Relatively Level of Electrification (%)
Ado	16	5	31.25	0.72
Efon	26	1	3.85	0.14
Ekiti East	23	6	26.09	0.86
Ekiti Southwest	32	5	15.63	0.72
Ekiti west	79	4	5.06	0.58
Emure	42	2	4.76	0.29
Gbonyin	36	9	25.00	1.30
Ido/Osi	55	10	18.18	1.44
Ijero	28	14	50.00	2.02
Ikere	42	2	4.76	0.29

Table 2: Contd.,

Ikole	24	20	83.33	2.88
Ilejemeje	11	5	45.45	0.72
Ise/Orun	42	5	11.90	0.72
Irepodun/Ifelodun	120	13	10.83	1.88
Moba	67	10	14.93	1.44
Oye	51	10	19.61	1.44
Total	**694**	**121**		**17.44**

Table 3: Matrix Incidence of Simplified Ekiti 33KV Network

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
4	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	-1	0	1	1	0
5	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
10	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-1	0
21	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
60	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

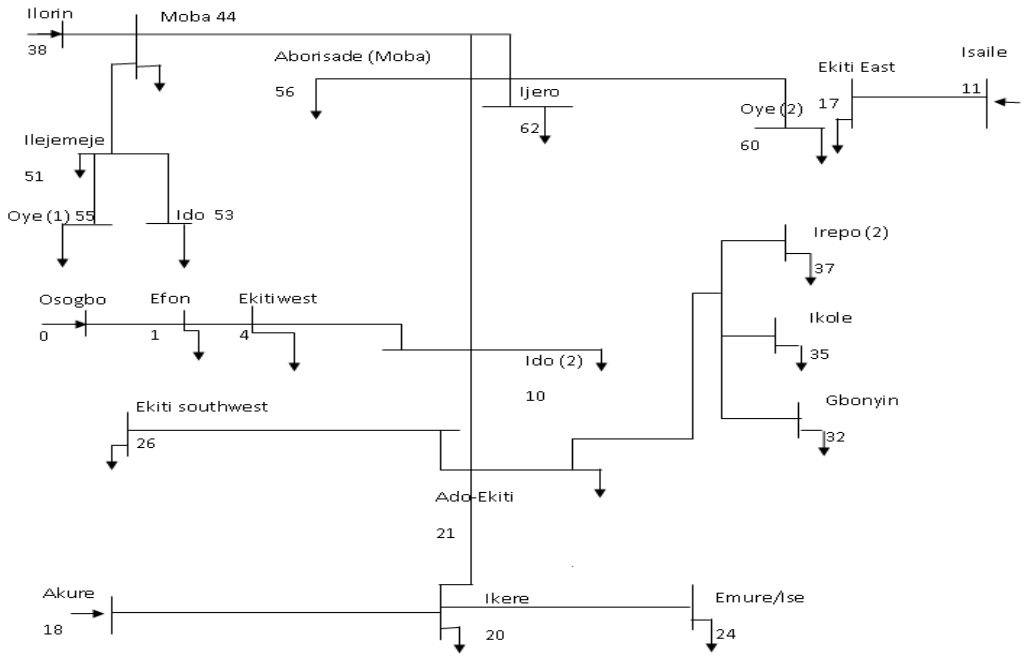

Figure 1: Simplified Ekiti 33kv Network

RESULTS AND DISCUSSIONS

Table **3** shows the bus incidence matrix of Ekiti 33 KV network. This shows the power flow for the figure 1. Power flow is positive one when power flows in the same direction and from a node to another node. It is negative in the opposite direction. It is zero when there is no connection between the nodes. Ikole LGA has highest level of electrification at 83.33% and lowest at Efon LGA. Table 1 shows that more people in the rural ares in Nigeria using firewood as means of powering households when compared to urban centres was expressed as 13.10%. Electricity access is 20% as compared to urban centres with 57.20% Table 2.0 shows the results of algorithm to determine the level of electrification in which Ado LGA is only 31.25% with relative level of electrification of 0.72%. Ijero has 50% electrification level with relative electrification level of 2.02%.The entire Ekiti state is electrified at 17.44% as shown in table 1.

CONCLUSIONS

The present rural electrification level is estimated as 17.44%. This obviously shows the abnormal 82.56% of in-accessibility to electrification in the state.

RECOMMENDATIONS

- Ekiti State`s level of rural electrification at 17.44% requires active attention in order to increase the level to at least 50% between 2016 and 2020.
- Furthermore urgent drive should be given to rural electrification in the state to reach between 75% - 85% within the range of 2020 - 2025.
- Also vigorous drive should be given to rural electrification access to reach 100% between 2025- 2040.
- Improved level of electrification access will give room to commercialization and industrialization of the state and improve the lives of rural people.

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