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THE CAUSES AND EFFECT OF ELECTRIC POWER OUTAGES IN THE NORTH EASTERN ZONE OF NIGERIA, USING MUBI IN ADAMAWA STATE AS A CASE STUDY

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ABSTRACT:
This paper is examining the causes and effect of electric power outages in the north eastern zone of Nigeria with particular reference to Mubi in Adamawa state. In carrying out this examination, daily supply statistics of electricity was taken for a period of one year and five months spanning the interval between June 2012 and October ending 2013. The record shows that electricity supply was not available most of the times with the worst period being the month of August to October 2012 and March, May, June and October, 2013. This period also witnessed high level of criminal and terrorist activities.
Key words: Electric power, outages, Daily supply, Period, Systems.

INTRODUCTION

Darkness is very strange to man and strange to life itself. Life becomes meaningless without light. Light is so important to the entire universe that it was the first thing God created. Since the invention of commercial electricity by Michael Faraday (1831) and the invention of electric bulb and electric distribution system by Thomas Edison (1879), people have been psychologically and emotionally attached to electric energy. The world civilization revolves around it. Every area of human endeavour is positively affected by it. Starting from the humble task in residential areas like ironing fabrics, using of heaters and air-conditioning to the very complex industrial plants in the manufacturing and the explorative industries, electric power requirement cannot be compromised. Entertainment, medical, government, commercial, financial and educational institutions, owe their successes to the adequacy of electric power. Hence the issue of electric power outages is never tolerated. Its frequent occurrence is usually an indicator to economic doom of a nation if it is not quickly and adequately arrested by other alternatives. In line with this, Uchendu (1993) observed that electricity outage becomes problematic when its duration is high because of the attendant disruption in economic activities. In the design of electric power systems, the objectives of minimizing electricity outage and providing high quality services are paramount in setting system reliability target. While utilities aim at high reliability levels, their ability to achieve them is limited by high capital requirements and consumers willingness to pay.

Since 2007 to date, the issue of power supply in the Nigerian state is a heated discussion in various gatherings like the national assembly, the media (both print and electronic), academic workshops and conferences. Various ideas and solutions have been proffered which are yet to work out. Sometimes in some gatherings like in the engineering conferences and workshops (COREN and NSE) for example, discussants emotional ambers have been flared when one imagines the fact that Nigeria cannot meet even up to 50% of its power supply needs despite the huge investments in the sector. Nigeria is the largest black race in the world with a population of over 150 million people and highly blessed with human and material resources. Yet countries with lesser population and less material endowment are meeting up their power requirement needs. Until very recently Ghana which is our closest neighbour

was boasting of 24 hours uninterrupted power supply for about one year. According to http://www.nairaland.com, the problem is caused by low gas supply from Nigeria. It is a known fact that most businesses, especially manufacturing industries which once had their head quarters in Nigeria have moved to Ghana to establish. To this, Arobieke *et a.l* (2012) agrees that there is no excuse for power failure in Nigeria because it is possible to have uninterrupted power supply as is the case in several countries of the world (both developed and developing).

Causes of Power Outages in Nigeria

The following are the causes of power outage in Nigeria.

Aging power system structure: Most of the power plants are old and outdated. When these plants were installed mostly in the sixties and seventies, the population and demand was not as high as is the case now. The capacity of some of the plants have been stretched beyond limits, hence breakdown occur easily. Udoh (2009) agrees with the fact that facilities including electrical power installations whose lifespan have stretched between 40 to 50 years needs upgrading because of their significant deteriorating tendencies that leads to system breakdown on continuous use. Aging power system structure can survive this lengthy period of usage only on the condition of proper maintenance culture by the stakeholders.

Poor power system maintenance: One of the things bedevilling the country is poor maintenance culture in almost all facet of its national life. Any government property is no person's property; therefore it can be treated with reckless abandon. People hardly take responsibility when it has to do with public infrastructure. There are lots of wastes in the system. Decayed and abandoned infrastructure litter all over the country. This touches also on power system equipment. According to Arobieke *et-al* (2012), part of Ondo State was in darkness for two weeks in March 2012 because some components in the National Switching centre at Oshogbo were burnt and replacement could only be done after the expiration of two weeks, which was the time required for the parts to be ordered abroad. The lost time could have been saved if the right attitude to maintenance of the system was adopted from the onset as the failed parts could have been stored ahead of that period.

Vandalization of power system components: Unemployment and poverty are the twin evils that have pushed the Nigerian youth to acts of criminality of which vandalism is one of them. Stories of breaking of oil pipe-lines to steal petroleum products and cutting of power line cables by unemployed youths are common in the nation's news bulletins. When the power line equipment is tempered with, the power supply to the area covered by the network is cut off. Hence the resulting scenario is power outage in the affected area. This is in line with Uchendu (1993) that with regards to power system components, vandalization is one of the issues affecting the reliability of power supply in the country.

Accidents involving power system structure: With frequent accidents on our roads involving vehicles, power system structures are sometimes affected. There are times vehicles crash on electric poles or trees falling on power lines thereby cutting off supply to the affected area. Also accidental contact with underground or overhead power lines at construction sites can cause power outages. The Dana plane crash in a residential area in Lagos in June 2012 which disrupted power supply in that part of the state is one example of how accidents could cause power outages.

Short circuit in the system: The power system is so constructed so as to respond to short circuit faults as fast as possible by its various protective gears. Small animals like snakes, birds and bats can cause a short circuit when they climb on the power system equipment such as transformers, feeder pillars or fuses. This causes the equipment to short down resulting in power outage in the affected area. However shorting down the equipment protects the rest of the system to prevent widespread outages.

Overloading of the power system: Due to poor planning and inadequate load estimation or forecasting, the power system equipment handling a particular area like the power transformer could be overstretched leading to the overloading of the system. If the system is adequately protected the circuit breakers will trip cutting off the power supply to that particular area. In a situation where the power system structure lacks the necessary protection, the whole structure will be damaged leading to prolong

period of outage in that area. This sort of condition is usually caused by population growth resulting in corresponding city expansion. Megacities like Lagos, Abuja and Port-Harcourt are examples.

Weather related factors: Electric power delivery systems are mostly vulnerable to extreme weather conditions like heavy rainfall accompanied by high winds and flooding. For example, in the year 2012 between the months of July to September, most communities in Adamawa, Gombe, Bauchi, Taraba and parts of Borno states were destroyed because of excessive rainfall and flooding. The power lines, sub-transmission and distribution substations in these communities were badly affected. This scenario resulted in sustained power outage for a period of over three months. Mubi town a community in Adamawa state were this study is conducted primarily was also affected with total blackout of electricity. This was so because it receives power supply from Gombe through Damboa in Borno state.

Environmental factors: Although the North Eastern Region of Nigeria is exempted from natural causes of environmental degradation like earth-quake, tremor and landslides, the human activities in the region poses a threat to the environment. Power supply equipment are usually affected by a degraded environment. For example, mining activities in parts of Gombe State near electrical installations causes land tremor at locations where power supply equipment are installed like the transformer. This weakens the soil surrounding it, causing vibration on load condition. This can generate fault in the equipment with the attendant effect of power disruption. Also tree falling activities in parts of Borno State sometimes affects power transmission lines when trees fall on them causing faults like the short circuit or open circuit by a severed line.

Failed parts of power supply equipment: Power system is designed to meet customers' demand in real time; that is, the supply and demand must be constantly and precisely balanced. Because electricity itself cannot be stored in a large scale, part failure of power system equipment directly affects the supply. When this happens outage is inevitable. This has been a regular occurrence in our power system network.

Not operating the power system within its critical point: Electric power grids are self organised critical systems when it concerns large power systems. They exhibit unavoidable disturbances of all sizes within a small area and then extend to the entire system. Outage frequency increases when the system is operated very close to its critical point. Within the limits of modern engineering and computer modelling, the system can be made to move away below the critical point to reduce the frequency of outages. Critical point of a power system is a point where a system undergoes phase transition from a steady reliable grid with few cascading failures to a very sporadic unreliable grid with common cascading failures.

Inadequate gas supply: The issue of gas supply ranges from shortage of gas supply from the gas producers to abrupt disruption of supply due to shutting down of gas plants for maintenance. According to media reports, abrupt disruption of gas supply to the thermal stations had on several occasions resulted to the tripping of transmission lines during the period under review. The closure of gas plants by the International Oil Companies (IOCs) for routine maintenance is one example.

PHCN's Indebtedness: The failure of PHCN to settle its multi-billion naira debts to gas and power supplies contributed to the poor power station performance that resulted in power outages during this period. According to media reports for example, PHCN owes Agip Oil billions of naira for its power plant at Okpai in Delta state which sells 470 MW to PHCN. It also owes Shell Oil for its power plant which generates 561 MW at Afam in Rivers state.

Power Outages in Other Countries

The issue of electric power outage is a global phenomenon that affects even the most advanced countries of the world. According to Campbell (2012), the United States of America has an annual outage time per customer of about 240 minutes. United Kingdom has 90 minutes per customer per annum. Spain has 104 minutes, while Netherlands and Denmark have 33 and 24 minutes respectively per customer. Austria has 72, France has 62 and Italy has 58. These figures of outages duration are very infinitesimal compared to what Nigeria suffers. India too has her own share of outages. Marshall (2012)

reported that India has been suffering from regular smaller outages. That it does not generate enough electricity to meet the demands of its people and has 10 percent shortfall at peak times. A major outage did occur in India where about 600 million people were affected for several hours – half of the country without power.

RESEARCH METHODOLOGY

The study area is the North-East zone of Nigeria, with particular reference to Mubi town in Adamawa State. The procedure adopted was to take daily records of power supply between the months of June 2012 and October 2013. The summary of the records is shown in Tables 1a, 1b and 1c.

RESULTS AND DISCUSSION

Tables 1a, 1b and 1c show the power supply profile in terms of duration for the period under study. The duration of the outages are shown on daily basis. To make tabulation easy and the results communicable, the durations of both the supplies and the outages are reflected on hourly basis. In the Tables shown, the outage duration is the difference between the total number of hours per day minus the daily supplies of electric power. The results show that there was no power most of the time. The supply was very scanty even in situation where there was energy. The month of August to October 2012 was a period of total blackout. November and December 2012 had some scanty period of supply. That was very infinitesimal compared to the period of blackout. The year 2013 was not even better despite government promises. From the Tables, it could be observed that the month of March, May, June and October had the worst outages. October 2013 was outstanding among the worst cases this year as there was no single blink of light throughout the month. From June 2012 to October 2013, the best of the months were August and September 2013, with August 2013 being the most outstanding in terms of power supply. However, the supply duration is still low when the expectations of the end users are taken into consideration. The highest was a 12-hour supply once followed by a 10-hour supply once in the month of August 2013.

Effect of Power Outages in the Study Area

The negative effect of power outages in Nigeria, particularly in the North East zone is enormous. The costs of these are spoilage of perishable goods in shops and homes, lost of man – hours for business operators like welders, tailors, photocopying and computer operators. In institutions of learning according to Udoh (2004), effective studying and research by both staff and students have been greatly impaired as a result of shortage of electricity supply. In the Federal Polytechnic Mubi, Adamawa state – Nigeria for example, conducts of practicals and experiments have been very frustrating because of unavailability of electricity. The story is the same for all other institutions of learning. This may explain the ongoing Academic Staff Union of Universities' prolonged strike and that of the Polytechnics also, that are pressing on government to improve the learning environment of these institutions through the provision of adequate infrastructure, of which electricity is the driving force. To these, Campbell (2012) supports in his paper as he rightly observes that power outages can impact electricity consumers primarily through property loss and business disruption. This he said can result in loss orders, damage to perishable goods and inventories for businesses. Furthermore, power outage can critically affect manufacturing operations mainly through downtime as workers are idle and potentially damage equipment and production processes. Medical services in hospitals and clinics have been hampered and human lives lost in some cases.

During these periods of outages, criminal and terrorist activities have been on the increase particularly in the study area. There have been repeated killings and destruction of properties during the dark periods. In Mubi for instance, some people including students have lost their lives to terrorists. In August 2012 by 8.00 pm, one student was shot to death while others sustained injuries as they were returning home from a church programme in Barama near Federal Polytechnic main gate. The incidence of the night of October 1st 2012, where many of the Polytechnic students were shot to death as they were preparing for their final semester examinations is still lingering in the memories of people

and was a major headlines in the media. Throughout that period there was no power and the atmosphere was dark and scary in the night.

REMEDIAL ACTION TO THE OUTAGE PROBLEM

Private sector participation: From experience, the issue of electric power supply cannot be successfully managed by the government. There is usually lack of commitment in the handling of government business. Starting from the period of the Nigerian Airways, the Nigerian National shipping Line to the recent NITEL, government has never satisfied the public in providing adequate services. It is the private sector that has always come to the rescue. No miracle should be expected in the electric power industry until when fully handed over to the private sector. Government should only provide regulatory services as in other sectors of the economy.

Development of small hydro schemes: From studies according to Udoh (2004) and Adebayo and Yusuf (2013), the North – East zone has small hydro potential of about 86 sites which can generate 226.1 MW of electricity along the Benue and Chad river basins.

Development of wind and biomass energy schemes: Wind power can be developed in the North East zone to generate electricity. According to Ogwo (2010), the North east zone is blessed with abundant wind resources, and that the Energy Commission of Nigeria can provide the micro-siting data. Also, according to Abubakar (2010) biomass resources are available in the zone under study, particularly the *Jatropha curcas* plant which is a popular feedstock for future bio-fuel. This highly drought-resistant species is adapted mostly to the arid and semi-arid conditions of which the North-East zone is part.

CONCLUSION

In this paper the causes and effect of power outages in the North-East zone of Nigeria have been highlighted. The study shows that the zone is highly deficient in electric power supply. Some of the causes are human, infrastructural defects, weather related and environmental factors. The effect is the loss of man hours in business and government institutions. This has resulted in potential increase in crime and terrorist activities within the zone. Remedial action proffered is the involvement of private sector participation in the power industry and the development of renewable energy schemes.

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DAILY POWER SUPPLY PROFILE FOR MUBI TOWN

Table 1a: June – December, 2012

Date	June		July		August		September		October		November		December	
	Sup	**Out**	**Sup**	**Out**	**Sup**	**Out**	**Sup**	**Out**	**Sup**	**Out**	**Sup**	**Out**	**Sup**	**Out**
1	4.0	20.0	2.0	22.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	2.0	22.0
2	2.5	21.5	0.0	24.0	0.6	23.4	0.0	24.0	0.0	24.0	0.0	24.0	1.4	22.6
3	3.0	21.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.5	23.5	0.0	24.0
4	1.5	22.5	2.3	21.7	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
5	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
6	0.0	24.0	3.8	20.2	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
7	3.5	20.5	2.0	22.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
8	2.0	22.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
9	0.0	24.0	1.0	23.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
10	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	1.5	22.5	4.5	19.5
11	0.3	23.7	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	2.0	22.0	4.0	20.0
12	1.8	22.2	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
13	1.6	22.4	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
14	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
15	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
16	7.0	17.0	2.0	22.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
17	0.2	23.8	1.2	22.8	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	3.0	21.0
18	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	5.0	19.0
19	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
20	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
21	0.2	23.8	1.0	23.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
22	2.0	22.0	3.1	20.9	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
23	0.0	24.0	1.3	22.7	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
24	0.0	24.0	0.2	23.8	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	4.0	20.0
25	0.0	24.0	1.0	23.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	8.0	16.0
26	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	3.0	21.0	6.0	18.0
27	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
28	1.0	23.0	1.0	23.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
29	1.5	22.5	5.0	19.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
30	2.4	21.6	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	1.2	22.8	0.0	24.0
31	-	-	0.0	24.0	0.0	24.0	-	-	0.0	24.0	-	-	0.0	24.0

Key: Sup = Duration of Electric Power Supply in hours

Out = Duration of Electric Power Outage in hours

DAILY POWER SUPPLY PROFILE FOR MUBI TOWN

Table 1b: January - June, 2013

Date	January		February		March		April		May		June	
	Sup	Out	Sup	Out	Sup	Out	Sup	Out	Sup	Out	Sup	Out
1	5.0	19.0	3.0	21.0	0.5	23.5	2.0	22.0	0.0	24.0	0.0	24.0
2	4.0	20.0	4.0	20.0	0.6	23.4	8.0	16.0	0.0	24.0	0.0	24.0
3	0.0	24.0	6.0	18.0	0.0	24.0	6.0	18.0	2.0	22.0	0.5	23.5
4	1.5	22.5	3.0	21.0	0.0	24.0	8.0	16.0	0.0	24.0	0.0	24.0
5	0.0	24.0	0.0	24.0	0.0	24.0	4.0	20.0	0.0	24.0	0.0	24.0
6	0.0	24.0	3.8	20.2	0.0	24.0	4.0	20.0	0.0	24.0	0.0	24.0
7	5.5	18.5	2.0	22.0	0.0	24.0	3.8	20.2	0.0	24.0	0.0	24.0
8	2.0	22.0	0.0	24.0	0.0	24.0	6.0	18.0	0.0	24.0	0.0	24.0
9	0.0	24.0	1.0	23.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
10	4.0	20.0	0.0	24.0	0.0	24.0	6.0	18.0	0.0	24.0	0.4	23.6
11	4.0	20.0	2.0	22.0	0.0	24.0	2.0	22.0	0.0	24.0	0.0	24.0
12	2.0	22.0	4.0	20.0	0.0	24.0	5.0	19.0	0.0	24.0	0.0	24.0
13	1.6	22.4	3.0	21.0	0.0	24.0	3.0	21.0	0.0	24.0	0.0	24.0
14	5.0	19.0	7.0	17.0	0.0	24.0	3.4	20.6	0.0	24.0	0.0	24.0
15	3.0	21.0	0.0	24.0	0.0	24.0	4.2	19.8	0.0	24.0	0.0	24.0
16	0.0	24.0	2.0	22.0	0.0	24.0	2.0	22.0	0.0	24.0	0.0	24.0
17	0.8	23.2	5.0	19.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
18	6.0	18.0	4.0	20.0	1.0	23.0	6.0	18.0	0.0	24.0	0.0	24.0
19	4.0	20.0	6.0	18.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
20	5.0	17.0	3.0	21.0	0.0	24.0	5.0	17.0	0.0	24.0	0.0	24.0
21	0.0	24.0	1.0	23.0	0.0	24.0	1.0	23.0	0.0	24.0	0.0	24.0
22	3.0	21.0	7.0	17.0	0.0	24.0	6.0	18.0	0.0	24.0	0.0	24.0
23	2.0	22.0	1.0	23.0	0.0	24.0	3.0	21.0	0.0	24.0	0.0	24.0
24	4.5	19.5	0.6	23.4	0.0	24.0	4.0	20.0	0.0	24.0	0.0	24.0
25	8.0	16.0	1.5	22.5	0.0	24.0	8.0	16.0	0.0	24.0	0.0	24.0
26	3.0	21.0	0.8	2.0	0.0	24.0	2.0	22.0	0.0	24.0	3.0	21.0
27	6.0	18.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
28	2.5	21.5	1.8	22.2	0.0	24.0	2.0	22.0	0.0	24.0	0.0	24.0
29	3.0	21.0	-	-	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
30	2.0	22.0	-	-	0.0	24.0	0.0	24.0	0.0	24.0	0.0	24.0
31	10.0	14.0	-	-	0.6	23.4	-	-	0.0	24.0	-	-

Key: Sup = Duration of Electric Power Supply in hours

Out = Duration of Electric Power Outage in hours

DAILY POWER SUPPLY PROFILE FOR MUBI TOWN

Table 1c: July - October, 2013

Date	July		August		September		October	
	Sup	Out	Sup	Out	Sup	Out	Sup	Out
1	2.0	22.0	0.0	24.0	6.5	17.5	0.0	24.0
2	0.0	24.0	0.5	23.5	7.6	16.4	0.0	24.0
3	0.0	24.0	9.7	14.3	8.0	16.0	0.0	24.0
4	2.2	21.8	9.0	15.0	0.0	24.0	0.0	24.0
5	0.0	24.0	6.0	18.0	5.0	17.0	0.0	24.0
6	5.2	18.8	3.8	20.2	4.0	20.0	0.0	24.0
7	0.0	24.0	2.0	22.0	6.0	18.0	0.0	24.0
8	0.3	23.7	10.0	14.0	4.0	20.0	0.0	24.0
9	0.0	24.0	8.0	16.0	3.7	20.3	0.0	24.0
10	0.0	24.0	5.0	19.0	2.2	21.8	0.0	24.0
11	0.0	24.0	6.0	18.0	0.0	24.0	0.0	24.0
12	0.0	24.0	12.0	12.0	3.0	21.0	0.0	24.0
13	0.0	24.0	6.0	18.0	0.0	24.0	0.0	24.0
14	0.0	24.0	7.2	16.8	2.0	22.0	0.0	24.0
15	0.0	24.0	0.0	24.0	1.5	22.5	0.0	24.0
16	1.7	22.3	5.4	18.6	4.0	20.0	0.0	24.0
17	1.2	22.8	5.0	19.0	3.0	21.0	0.0	24.0
18	0.0	24.0	4.0	20.0	1.0	23.0	0.0	24.0
19	0.0	24.0	6.0	18.0	5.0	19.0	0.0	24.0
20	0.0	24.0	3.0	21.0	3.0	21.0	0.0	24.0
21	4.3	19.7	5.0	19.0	6.0	18.0	0.0	24.0
22	3.1	20.9	7.0	17.0	4.0	20.0	0.0	24.0
23	1.2	22.8	4.0	20.0	2.0	22.0	0.0	24.0
24	0.2	23.8	6.6	17.4	0.0	24.0	0.0	24.0
25	0.0	24.0	2.5	21.5	2.0	22.0	0.0	24.0
26	0.0	24.0	8.4	15.6	2.0	22.0	0.0	24.0
27	0.0	24.0	3.0	21.0	4.0	20.0	0.0	24.0
28	1.0	23.0	0.8	23.2	0.0	24.0	0.0	24.0
29	4.9	19.1	6.0	18.0	2.6	21.4	0.0	24.0
30	0.0	24.0	8.4	15.6	0.0	24.0	0.0	24.0
31	0.0	24.0	7.0	17.0	-	-	0.0	24.0

Key: Sup = Duration of Electric Power Supply in hours

Out = Duration of Electric Power Outage in hours