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Impact of Electricity Power Outage on the Small and Medium Scale Enterprises (SMEs) Productivity in FCT, Nigeria

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Abstract

Electricity Infrastructure has been identified as the key constraint to private sector development in Nigeria. Hence, this study analysed the cost of power outages to the small business sector of the Nigerian economy using both a survey technique and logit model approach. The study revealed that the poor state of electricity supply in Nigeria has imposed significant costs on the business sector. The bulk of these costs relate to the firms' acquisition of very expensive backup capacity to cushion them against the even larger losses arising from frequent and long power fluctuations. Small-scale operators are more heavily affected by the infrastructure failures as they are unable to finance the cost of backup power necessary to mitigate the impact of frequent outages. The small-scale operators that could afford to back up their operations have to spend a significant proportion of their investment outlay on this. The study therefore recommended for institutional reforms of the power supply sector in Nigeria.

Keywords: Power outage, SMEs, Productivity and Electricity Infrastructure.

INTRODUCTION

Infrastructure has been identified as the key constraint to the Small and Medium Scale Enterprises (SMEs) development in Nigeria. Resource availability and input reliability shape productivity, especially in developing countries like Nigeria. For some resources like water, storage devices can be used to manage unreliable services (Baisa, Lucas, Stephen and William. 2014). However, electricity requires that agents respond in other ways, as power is prohibitively

expensive to store. A common response to sustained power supply issues is for firms to invest directly in self-generation technology. By crowding out other investment opportunities, blackouts reduce productivity (Reinikka and Svensson, 2012).

SMEs have played and continue to play significant roles in the growth, development and industrialization of many economies the world over. In the case of Nigeria, SMEs have performed below expectation due to a combination of problems which ranges from attitude and habits of SMEs themselves through environmental related factors, instability of governments and frequent government policy changes and somersaults (Aigbokan, 2009)

The potentials and opportunities for SMEs in Nigeria to rebound and play the crucial role of engine of growth, development and industrialization, wealth creation, poverty reduction and employment creation are enormous. The realization of this requires a paradigm shift from paying lip service to a practical radical approach and focus on this all-important sector of the economy by the government realistically addressing the identified problems. While SMEs themselves need to change their attitude and habits relating to entrepreneurship development, the governments (Local, State and Federal) need to involve the SMEs in policy formulation and execution for maximum effect (Ekpo, 2010).

Residential and commercial electricity consumers were given priority over industrial manufacturers. While historic in the magnitude of blackouts, this remains a major concern for Nigeria. The country had continued to face substantial power shortages. The severity of these blackouts dwarfs recent experiences in the United States. In 2004, China's Eastern electricity grid (an area including Shanghai) alone curtailed over 13,000,000 MWH, accounting for over two percent of annual consumption. In comparison, the rolling blackouts of California's crisis in 2000-2001 curtailed less than one 1000th that amounts. It is fairly settled in the literature that infrastructure plays a critical and positive role in economic development (Kayode, 2011).

Infrastructure interacts with the economy through multiple and complex processes. It represents an intermediate input to production, and thus changes in infrastructure quality and quantity affect the profitability of production, and invariably the levels of income, output and employment. Moreover, infrastructure services raise the productivity of other factors of production (Kessides, 2013). The provision of infrastructure in most developing countries is the responsibility of the government. This is because of the characteristics of infrastructure investment.

First, infrastructure supply is characterized by high set-up cost. Second, its indirect way of pay-off, coupled with its long gestation period, makes it generally unattractive to private investors. The Nigerian Power Sector is marked by low generating capacity relative to installed capacity and much of the country's citizens do not have access to uninterrupted supplies of electricity. At present, electricity generation ranges from between 2,500 megawatts to about 4,000 megawatts, even with the inclusion of three gases powered independent power projects in the Niger Delta Region, estimated national consumption is in excess of 10,000 megawatts (Ayodele, 2012).

Previously, the state owned Power Holding Company dominated the sector. In February, 2005, the World Bank agreed to provide NEPA $100million to assist in its privatization effort. Only 40% of the population has electricity, the majority of whom are concentrated in urban areas, it is estimated that an additional 10,000mw in capacity is required to meet current demand (Nnanna, 2015)

Nigeria has enjoyed relatively strong economic growth over the past seven years but poverty is still a major concern. Nigeria's economic development has been constrained by insufficient electricity generation capacity which results in a lack of reliable and affordable supply of power. For over three decades, Nigeria has been going through challenges in the electricity sub-sector (Udah, 2010)

Electricity generation transmission and distribution account for less than 10% of Nigeria's Gross Domestic Product (GDP) but 54% of the share of utilities (electricity and water) in the GDP (National Bureau of Statistics, 2016). Its contribution is very small compared to the size of Nigerian population.

In Nigeria, poor electricity supply is perhaps the greatest infrastructure problem confronting the business sector. The typical Nigerian firm experiences power failure or voltage fluctuations about seven times per week, each lasting for about two hours, without the benefit of prior warning. This imposes a huge cost on the firm arising from idle workers, spoiled materials, lost output, damaged equipment and restart costs. The overall impact is to increase business uncertainty and lower returns on investment. For the aggregate economy, this has seriously undermined Nigeria's growth potential and the attractiveness of the economy to external investors.

The National Electric Power Authority (NEPA), now known as Electricity Distribution Company is the public utility vested with the responsibility of electricity supply in Nigeria. However, the failure of NEPA to provide adequate and reliable electricity to consumers despite billions of naira of investment expenditure has generated a confidence crisis in the industry. Public confidence in NEPA's ability to supply uninterrupted and stable electric power is so low that consumers have coined a term for the organization's acronym NEPA as "Never Expect Power Always".

The inefficiency of NEPA imposes a huge cost on the economy. In 1990, the World Bank estimated the economic loss to the country from NEPA's inefficiency at about N1 billion. There are essentially five ways by which firms may respond to unreliable electricity supply.

However, it is on this basis that this research work is to check the impact of electric power outage on the productivity of the Nigerian economy. On the other hand, the specific objectives is to investigate the extent to which small and medium scale firms products are affected by electric power outage.

LITERATURE REVIEW

Small and medium scale Enterprises (SMEs) have been contributing much in national development, which may include the socio-economic processes. Which issues of the character, structure, pattern and evolution of desirable impersonal relations of production distribution allocation and utilization of availability resources in any country, wheel in order to maintain the level of development and manage the available resources equally distributed and allocation efficiently utilize them and subsequently put economic development firmly on a way of modern technologies with respect to production distribution allocation and utilization are designed and tried strictly to the use of energy from one to the other (Ayodele, 2012).

The importance of small and medium scale industries in their potentials for job creation, innovation and mostly found to be the major sources of technological innovation. It is a fuel to every country’s economic progress. Much of the attention surrounding growth in the small firms has focused on capital structure decisions, and power supply (electricity) and dominant in the small and medium scale industries (Terpstra and Olson 2011).

Electricity power supply development in Nigeria stated in 1896 in Lagos city. Various generating sets were later installed in different towns as the imperial rule spread across the country. The pattern of electricity development after then was in the form of electricity undertakings set-up at various towns, some by the federal government under the public works department (PWD) and some by the native municipal authorities. In 1950, the colonial government connected all these isolated power station previously under the electricity corporation of Nigeria (ECN). Thus ECN became the statutory body responsible for generation transmission, distribution and sales of electricity to all consumers in Nigeria (Adeleye 2012).

In 1962 the Niger Dam, Authority (NDA) was established for the construction of Kainji Dam, the first hydroelectricity power station was commissioned in 1968 with an ultimate 24 installed capacity of 760MW, In 1972, the activities of both ECN and the MDA were merged and vested as one authority, the national electric power authority (NEPA), now power holding company of Nigeria (PHCN). According to Adeyemo (2015), electricity is that part of infrastructure which is the basic physical facility upon which all other activities in the system significantly depend on. Development economist under scored the need to building up electricity, as a key stimulus to development. It has been assented that an analysis of electricity is invariably a part of the study economic development (Ukpong, 2014).

Empirical Review

In a global context, a general definition of the small and medium scale industries using size and scale of operation is not easy but with the fixed coordinates of national boundaries, it might be relatively easier (Olorushola, 2011). This is so because what is considered a small-scale enterprise in one country may be regarded as medium or large-scale enterprise in another (Osuala, 2014, Anigwe, 2012). As a result, each country tends to defend these categories of enterprises (i.e micro small and medium) based on the country level of development (Olorunsola, 2011).

An over view of the performance of the SMIs in Nigeria scholars that SMIs account for a about 70 percent of the total industries employment in Nigeria but only contribute 10-15 percent of the total manufacturing output (Soludo, 2013). In federal government small scale business development plan (SBDP) seeks a small scale enterprises as any manufacturing process or services industry with a capital investment not exceeding N150,000.00 in machinery and equipment and employing not more than 50 workers (Osuala, 2014). The central bank of Nigeria (CBN) for the purpose of credit guideline to financial institution classifies as small and medium scale industries those enterprises with an annual turnover between the range of N100,000.00 to N150,000.00 with less than 50 employees with asset base (excluding real estate) of not less than 1 million (CBN, 2015). This sector has not experienced any positive performance recent past because the potentials of the sector have not been significantly exploited. Many factors have constrained the growth of the sector and one of these factors is inadequate and epidemic power supply (electricity). This problem occupies over 50 percent of Nigerian's SMIs problem (Kayode, 2011).

Power supply is the most important commodity for national development. With electrical energy the people are empowered to work from the domestic level and the cottage industries, through the small scale and medium industries to employment in the large –scale and manufacturing complexes. Its factors input in the production process of 30 Small and Medium scale Industries in particular and the manufacturing sector in general, for operation of plants.

Nasser (2015) in his study of the assessment of power failure on the manufacturing sector in Nigeria stated that the high cost by the firms in acquiring alternative power generation because they cannot enjoy the economies of scale advantage by public power. Despite the effect on high

price of good product, produced this had lead to high importation of foreign good to meet excess domestic demand. This has leaded to wide closure of firms, unemployment and price instability.

According to World Bank Research (2013), the study estimated that adoptive cost of electric failure on the Nigerian economy has equal 310million. US dollars divided between consumers back up capacity (25 million dollars) operating and maintenance cost of diesel auto-generators (90. million US dollars) fuel and lubrication 50 US dollars). Ukpong (2014) he used modified version of the production factor analysis method analyzing from 1965 to 1966 cost of power outrage on the industrial and commercial sector of the city of Lagos area in Nigeria this production function was of this form, $Q=F(X_1,X_2,X_3,X_4)$where Q= 31 industrials, x4 = electricity.

Holding other factors constants, he concluded that changes in output were directly related to change in electricity supply from a sample survey of thirty eight (38) firms. He estimated power supply to be equal to 130KW and 172KW in 1965 and 1966 respectively. Also he estimated lost in output as result of reduction in power supply in 1965 as N840,000.00 the corresponding figure for 1966 was N1378,000 he also stated that the loss in output affected national income increased inflation and unemployment. On a basis, his analysis revealed that the current and concrete industries suffered most from power failure, followed by food, metal product, textiles, and printing industries. And this has led to the slow growth or closure of most of these industries in Nigeria.

Moreover, the impacts of the unreliable electricity have become a regular event in most part of Nigeria. And these contribute with technical logistical failure and organization structure problem (Ukpon 2006 and Iwayemi, 2009). The factors affecting electricity reliability in Nigeria are weather, water level, social texture and fire coal of current 32 and future electricity demand vandalization and improper maintenance culture (Udhedu, 2015).

Theoretical framework

The theoretical framework of this study is the "big push" theory which is associated with the name of the professor Paul N. Rostern –Rodan from the work of Mordi, (2015). This theory of „big push" deal with large comprehensive program is needed in the form of high minimum amount of investment to overcome the obstacles to development in an underdevelopment economy and to launch economic development. Rostern- Rondan talked about three (3) indivisibilities which are pre-requisite for lunching economic development successfully. Among them is the indivisibility in the production function. He added that indivisibilities of input, output will lead to increasing returns. He regards social overhead capital as the most important instance of indivisibility. The services of social overhead capital comprises of infrastructure such as electricity supply, water supply, road, network etc. which are directly productive and have long gestation period.

METHODOLOGY

The data for this study were basically sourced from Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) database, National Bureau of Statistics (NBS) and administered structured questionnaire.

Sample Size Determination

The cross sectional data for this study was obtained using questionnaires. Based on the Krejcie and Morgan, (1970) table with a deterministic model as:

$$S = \frac{X^2\ NP\ (1-P)}{d^2\ (N-1)+X^2\ P(1-P)}$$

Where:

S = Sample size X^2 = Value of Chi-square N = Population size

P = Population proportion d = Degree of accuracy

Based on this proposition by Krejcie and Morgan, (1970), a sample size of 50 questionnaires was recommended using 95% confidence interval. In addition, the minimum sample size would be determined on the basis of 30 cases per variable/item for an accurate representation of the first canonical root (Stevens, 2001). The Bowley's model of deriving objective, valid and reliable sample was used which reduced the chances of error.

Model Specification

To assess the impact of electricity power outage on the productivity of small and medium scale firms in FCT, the study utilized the ***Logit Probability Model*** given as follows:

$$L = \frac{In(P)}{In(1-P)} = \beta_0 + \beta_1 EPG + \beta_2 EXP + \mu$$

Here, P= 1, if electricity power outage reduces the productivity of small and medium scale firm in FCT; (1-P), if otherwise. Here, the dependent variable is a dichotomous variable. The independent variables in the model are admixture of quantitative and qualitative variables, whileβ_0,$\beta_1$and β_2 are the parameters of the model to be estimated. The error term, μ which represents unobserved values, is assumed to be normally distributed, with zero mean and constant variance.

Definition of Variables used in the Model

Variables	Description
L:	P=1: If electricity power outage reduces the Productivity of small and medium scale firm in FCT; (1-P), if otherwise
EPG:	EPG=1: If there is constant electricity power outage In FCT; EPG=0: If otherwise
EXP:	Expenses on Alternative Electricity Power Supply

Method of Data Analysis

The Maximum Likelihood (ML) method is used to obtain estimates for the specified Logit probability model. The justification for using ML method is due to the fact that neither the ordinary least squares (OLS) nor the weighted least square (WLS) is helpful or adequate for estimating the Logit model. Moreover, that the Logit model is a nonlinear model. The parameter estimates of the specified Logit model are not directly interpretable with respect to magnitudes of effect but only interpretable with respect to the direction of effect on probability (Patrick *et al*., 1996).

Analysis and Interpretation of Results

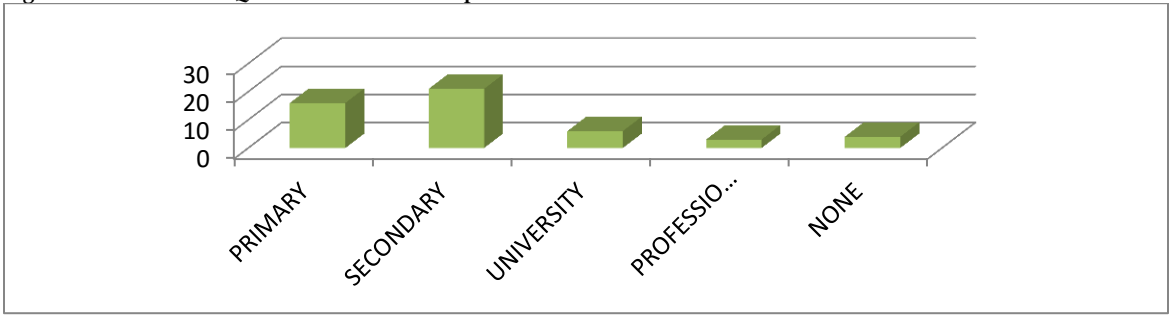
Characteristics of Respondents

Table 4.1: Educational Qualification of the Respondents

EDUCATIONAL QUALIFICATION	NO. OF RESPONDENTS	PERCENTAGE (%)
Primary Education	16	32%
Secondary or equivalent	21	42%
University degree or equivalent	6	12%
Professional certificate	3	6%
None of the Above	4	8%
Total	**50**	**100%**

Source: *Field Survey 2018.*

Figure 4.1: Educational Qualification of the Respondents



Source: *Field Survey 2018*

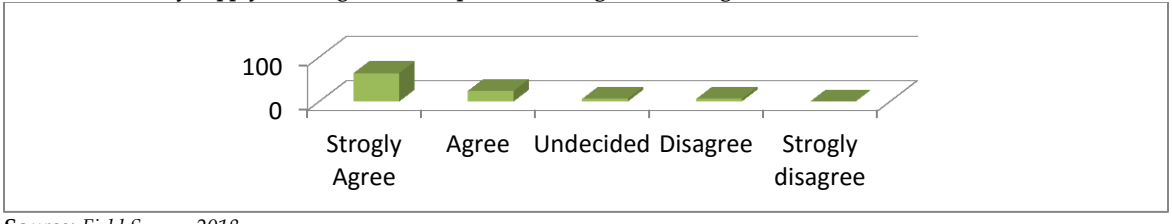
Table 4.1 shows that 16 respondents representing (32%) have primary education, 21 representing (42%) have secondary education, 6 respondents (12%) have obtained university degree or equivalent, 3 respondents (6%) have obtained professional certificate and 4 respondents representing 8% have no educational qualification. Therefore, this shows that the SMEs operators in Nigeria are literate.

Table 4.2: Electricity supply has a significant impact on SMEs growth in Nigeria

RESPONSE	NO. OF RESPONDENTS	PERCENTAGE (%)
Strongly Agree	32	64%
Agree	12	24%
Undecided	3	6%
Disagree	3	6%
Strongly disagree	0	0%
Total	**50**	**100%**

Source: *Field Survey 2018.*

FIG. 4.2: Electricity supply has a significant impact on SMEs growth in Nigeria

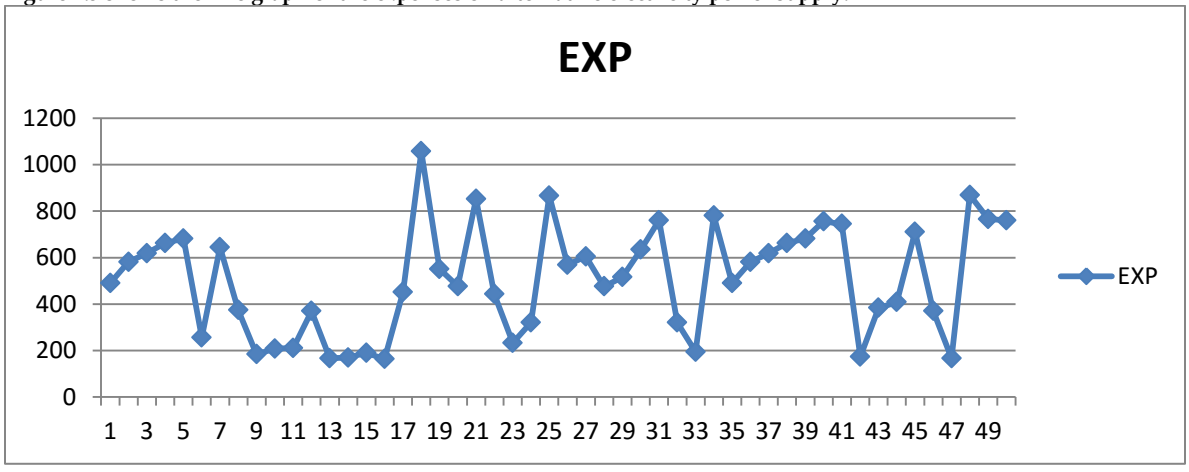


Source: *Field Survey 2018.*

From the table 4.2, it can be seen that out of 50 respondents, 32 respondents representing 64% strongly agreed that electricity infrastructure has a significant impact on SMEs development in FCT-Nigeria, 12 respondents representing 24% simply agreed, 3 respondents representing 6% did not decide, 3 respondents representing 6% disagreed, while 0 respondents representing 0% strongly disagreed.

However, in order to assess the impact of electricity power outage on the productivity of small and medium scale firms in FCT, Logit model estimation was carried out using both qualitative and quantitative based on fifty (50) small and medium scale firms that served as respondents of the administered questionnaires in appendix II. See also appendix I for the regression table.

Figure 4.3 shows the line graph of the expenses on alternative electricity power supply.



Figures 4.3 above shows the trending pattern of 50 selected small and medium scale expenses on alternative electricity power supply in FCT (EXP). The graphs revealed an unstable oscillation in EXP; an indication that the expenditure patterns of the firms in sourcing for alternative electricity power supply, due to power outage, varies.

DATA ANALYSIS

The estimated Logit regression model is given as follows:

Dependent Variable: L
Method: ML - Binary Logit (Quadratic hill climbing)
Date: 05/21/18 Time: 20:23
Sample: 1- 50
Included observations: 50
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.178752	0.780292	0.229084	0.8188
EPG	-0.180206	0.719746	-0.250375	0.8023
EXPP	0.001914	0.001474	1.297906	0.1943

McFadden R-squared	0.532087	Mean dependent var	0.740000
S.D. dependent var	0.443087	S.E. of regression	0.444311
Akaike info criterion	1.229339	Sum squared resid	9.278377
Schwarz criterion	1.344060	Log likelihood	-27.73347
Hannan-Quinn criter.	1.273025	Deviance	55.46693
Restr. Deviance	57.30569	Restr. log likelihood	-28.65285
LR statistic	18.38761	Avg. log likelihood	-0.554669
Prob(LR statistic)	0.000006		

Obs with Dep=0	13	Total obs	50
Obs with Dep=1	37		

Source: *Author's Computation using E-Views Software 7.0*

Interpretation of Results

The Logit estimate above revealed that the mean of the dependent variable is 0.740000 while the standard error of regression is 0.444311. These suggest adequacy of the estimated Logit model. More so, the model selection criteria such as Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn criterion (HQC) with respective low values of 1.229339, 1.344060and 1.273025indicate that the estimated Logit model is adequately specified.

The likelihood ratio (LR) statistic value of 18.38761with probability (LR stat) value of 0.000006 which is significant at 5% level of significance, suggests the absence of autocorrelation. The McFadden R-squared value of 0.832087 implies that about 53 percent of the change in the dependent variable was explained by the explanatory variables of the model. It also shows that the model has a good fit.

From the estimated Logit model above, we also observed that electricity power outage(EPG) had negative impact on the productivity variable of the small and medium scale firms; indicating that the probability of change in small and medium scale firms' productivity with respect to changes in electricity power outage (EPG) reduces by 18.03%. On the other hand, small and medium scale firms expenses on alternative electricity power supply in FCT (EXP) had positive impact on the productivity variable of the small and medium scale firms; implying that the probability of change in small and medium scale firms' productivity with respect to changes in EXP increases by 4.1%.

Hypothesis testing is based on Z-statistic. The Logit estimates above show that both electricity power outage (EPG) and small and medium scale firm's expenses on alternative electricity power supply in FCT (EXP) had insignificant impact on small and medium scale firms' productivity. This position is supported by the low Z-value and its corresponding high probability value (i.e., $p>0.05$).

CONCLUSION AND RECOMMENDATIONS

The use of electric power is taken as a close indicator of industrial activity and a significant index of standard of living. In the developing countries of the world, no activity is more basic to the fuller utilization of their resources than the development of the energy industries. Electricity, rather than the steam engine drives the developing industries of modern Africa. Nigeria, with the largest population in Africa and an energy resource base by African standards, both rich and varied, demonstrates many of the problems and potentialities of electricity production in the developing countries of the tropical world.

Electricity in Nigeria has been fluctuating. This is one of the major problems affecting the Nigerian economy. It has been pointed out that Nigeria has installed a generating capacity of over 8GW but is presently having an output of 2.5GW as at that date. At December 2014, it rose to an average of 3.5 GW. As a result, there is inconsistency in the daily power supply.

Nigeria has been described as belonging to the category of countries that are non-industrial. It is a fact that Nigeria is richly endowed with various energy sources such as crude oil, natural gas, coal, hydropower, solar energy, fissionable materials for nuclear energy. Yet, it is described as an energy poor country because the sector is relatively underdeveloped. The PHCN, a government parastatal, has the sole responsibility for managing the generating plants as well as distribution of power nationally. The total generating capacity is about 4000MW, approximately thrice the current level of national demand. However, the actual power available at any given time is less that 40 percent of the total capacity due to poor maintenance and inadequate infrastructure; hence there is a perennial shortage. This situation is exacerbated by a grossly inefficient, poorly maintained distribution system.

Recommendations

It is obvious that for the recent power supply improvement effort by government to be successful in the near future, a number of positive measures have to be taken. In view of this, and based upon the findings of the study, the following recommendations are made:

(i) The government should undertake a national demand study to determine the exact electricity requirement to meet demand in the short, medium and long-term.

(ii) A development of initiatives for diversifying electricity generation to improve security of supply as well as the development of the capacity to generate electricity closer to demand centres to reduce technical losses.

(iii) There is also a need to develop an appropriate pricing regime and incentive measures to attract investment and efficient operation and to develop gas production and supply grid as a national imperative.

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