The Effect of Electric Power Fluctuations on the Profitability and Competitiveness of SMEs: A Study of SMEs within the Accra Business District of Ghana

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Abstract

The economy of Ghana has attained a middle-income status and is seeking to advance; hence, an analysis of the economy based on the supply chain management of energy is significant to provide the quantitative results and comprehensive information about how and where the energy use affects economic growth and development. This information is necessary to enable the government to respond promptly with measures that will improve the supply of energy to ensure the profitability and competitiveness of firms. The objective of this paper is to analyse the effect of electric power fluctuations on the profitability and competitiveness of SMEs, using SMEs operating within the Accra business district of Ghana as a case study. This research is a cross-sectional survey and it adopted a mixed method approach. A sample of 70 Ghanaian SMEs was selected using a systematic sampling approach. Inclusion criterion for the selection of the SMEs was their location within the business district of Accra as well as their use of electricity in their main business operation. Data was collected with an interviewer-administered structured questionnaire which focused on the effect of power fluctuation on the operations of SMEs, especially on the profitability and its resulting effect on the firms' competitiveness. The SPSS statistical package was used to group and analyse the data. The study is a single-factor analysis of the exogenous problems facing the Small and Medium Enterprise sector. The study found that without reliable energy supply, SMEs are unable to produce in increased quantities and quality leading to poor sales hence low levels of profitability. It is established that low profitability negatively affects Return on Assets (ROA) and Return on Investment (ROI) of SMEs. Consequently, if the level of profitability is high, it is expected that ROA and ROI will be high and vice versa. With high profits, SMEs are able to increase their competitiveness.

Keywords: Electric power, power fluctuations, profitability, competitiveness, cost

JEL Classification: M00, M10, M31

1. INTRODUCTION

Research on SME problems in Ghana have so far concentrated on variables such as product and service development challenges, difficulties in accessing finance, competitiveness of SMEs and government policy and intervention in the area of SME development (Abdullah, 2013; Olumuyiwa and Mnse (2008). Whiles these variables were studied independently, there is a relationship between other variables like the price of energy (electric power) and an SME's capacity to

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produce optimally, its sales volume and labour cost. This study is therefore significant in drawing stakeholder attention to critical effect of energy supply on the growth and development of SMEs in Ghana with regards to its profitability and competitiveness. For SMEs in particular and for national economic development in general, the activities of electricity power providers are vital and they need to be monitored because *"in the utilities industry, where fully/sufficiently competitive environments are not achieved, the general public's interests are at risk, either through price exploitation, or through the degradation of quality of supply and customer services"* (Chau, 2009).

The role of electricity in Ghana's economy is prodigiously significant for growth and development. This has been amply captured in the mission statement of the Electricity Company of Ghana (ECG): *"To provide quality, reliable and safe electricity services to support the economic growth and development of Ghana"* (ECG, 2014 n.d). The reliable supply of electricity to the SMEs is indeed an important contributor towards the sustenance of Ghana's middle income status (Ofosu-Ahenkorah, 2008). The accomplishment of this mission is crucial for many reasons. Principal among them are:

- Electricity is the main driver for industrial development. Thousands of industries in Ghana use hydro-electric power for production, storage and distribution.
- Electricity serves as raw material for most small businesses (Watson, Viney and Schomaker, 2002).
- Electricity is used in every home for domestic purposes and to enhance quality of life.

Incidentally, in Ghana, electricity as an essential service enjoys protection from competition and consumers really have little or no choice (Chau, 2009; Watson et al., 2002). Economically, this implies that if there are difficulties along the supply chain of electricity, then the nation's growth and development will be vulnerable. Secondly, the interests of the general public, especially those who rely significantly on electricity, will be put to risk through price hikes and *"degradation of quality of supply and customer service"* (Chau, 2009). A study of the effect of power fluctuation on the profitability and competiveness of SMEs is therefore a crucial and necessary step for informed government action on energy.

2. RESEARCH OBJECTIVE

The main objective of this paper is to analyse the effect of electric power fluctuations on the profitability and competitiveness of SMEs, using SMEs operating within the Accra business district of Ghana as a case study. The study provides recommendations for governmental interventions in SME operations and for development of appropriate policy frameworks for the nation's energy sector. The specific objectives are:

a) To analyse the effect of power fluctuations on the Return on Asset (ROA) of SMEs

b) To analyse the effect of power fluctuations on the Return of Investment (ROI) of SMEs

c) To ascertain the cost of alternative sources of power and its impact on the competitiveness of SMEs

d) To examine the effect of power fluctuations on the expenditure patterns of SMEs

3. LITERATURE REVIEW

Analysis of the relationship between the energy sector and economic development has been ongoing though in scanty measures since the middle of the 19th century. However, the interest in the relationship was later fuelled by the energy crisis of 1970s that saw the increase of the study of energy costs of the production process and subsequent effects on industry and the economy as a whole (Jiang, Chen and Zhou, 2011). Many years later (in the 21st century), energy still holds a decisive significance for economic activity in that economic growth is determined by the energy resource of the country (Velasquez and Pichler, 2010).

3.1 Role of Electricity in Business

There is a symbiotic relationship between electricity and business. Energy supplies have a significant impact on economic activities (Velasquez and Pichler, 2010). This is because it is used for varied purposes ranging from production, storage, powering of office equipment and product display. Consequently, the use of electricity serves as input for production. This makes electricity an essential commodity for all industry types- manufacturing, service and distribution. Various sectors of the economy such as manufacturing and transport use enormous amounts of electricity (Haanes et al., 2011) for operation processes including storage, production. It is a critical resource needed to make products. In this respect, electricity as a "transformed unity" serves as a commodity. Consequently, suppliers of electricity have a strong influence on the buying organisation's ability to gain a competitive advantage and provide solutions to their clients. This is because operators of SMEs have a high dependency on electricity as a standardised input, without it they cannot produce to satisfy their customers. This dependency on suppliers therefore explains the value of electricity to SME operations along two trajectories namely: supply risk and reliability of supply (Haanes et al., 2011)

3.1.1 Supply Risk

The supply risk trajectory is a critical factor along the perception of electricity as a resource for the operation of SMEs (Halldorsson and Svanberg, 2013) In a report by UNIDO (2009), it was revealed that, in spite of the abundant resources Africa is endowed with, it still struggles with supply challenges in electricity. According to the UNIDO (2009) finding, only 26% of households have electricity making Africa the lowest in electricity penetration in all the continents. UNIDO (2009) reported that, an estimate of 547 million people in Africa lack access to electricity. Many reasons have been put forward by researchers and practitioners as the causes of such a predicament. For instance Mkhwanazi (2003) and Olumuyiwa and Mnse, (2008) have catalogued the following as the causes of poor access to electricity in Africa:

- Poor performance, resulting in poor quality of supply and service and an inability to meet growing electricity demand
- Insufficient managerial and technical skills to do the job
- Inability of the African country's government to fund expansion or refurbishment, or to attract private sector investment into the power sector
- Lack of maintenance of the existing facilities due to inadequate finance/technical leading to reliability problems

- Inappropriate tariffs, often resulting from political interference, with tariffs below marginal costs
- Poor governance or unstable governments due to regional and ethnic conflicts
- Poor economic status of African states especially south of the Sahara
- Inadequate revenue collection mechanisms, and therefore credit unworthy businesses
- Inadequate rainfall which causes power rationing

All these have culminated in poor supply of electricity with its attendant effects on the operations and performance of SMEs.

3.1.2 Reliability

Reliability of electricity supply is another trajectory that is closely linked to the supply risk trajectory. Reliability was catalogued as a dimension of service quality in the work of Parasuraman et al., (1988). It was then defined as the degree to which the retail service provides what was promised and when it was promised (Dabholkar et al., 1996). Electricity service providers have since measured system performance using reliability as an index (that is the proportion of uninterrupted customer hours provided per year out of a total number of customer hours provided per year) (Dabholkar et al., 1996). The deteriorating level of quality of electricity supply has since received a lot of researchers' attention.

In Africa in general and Ghana in particular, there are problems with the quantum of electricity supplied. The problems have been compounded with fluctuations in the supply of power which tends to affect business operations negatively. The New York Times in 2001 surmised that some business especially ICT-related businesses have suffered significant losses resulting from vulnerable electricity supply. Electricity interruption frequencies, the duration of the interruptions and/or load curtailment have been known to cause a lot of difficulties for specific industries particularly those that use electricity as a resource. The electricity interruptions or fluctuations have had varying effects on businesses including but not limited to instantaneous damage to semi-finished goods, associated costs incurred in repairing equipment's and losses accrued from delayed or cancelled orders. Two types of interruptions have been identified. They are planned interruptions and unplanned interruptions.

- Planned interruptions have a mitigating effect on business operations because potential damage to semi-finished goods or materials can be minimised through the switch to alternative sources of electrical power such as generators and solar panels. Cost incurred due to delayed or cancelled orders or equipment repairs can also be avoided because production and delivery schedules can be adjusted ahead of time. However, the costs of alternate power sources such as power generators, as well as expenditure on overtime pay to staff and outsourcing service cannot be avoided (Wang, 2002).
- Unplanned interruptions, however, have unmitigated and sometimes unforeseeable effects on business operations. Often, there are damages that tend to affect product quality, semi-finished goods and costs incurred in repairing, and in delays in the delivery of orders. The cancelations in delivery are borne by businesses and that increases the operation and maintenance costs (Lai, Yik and Jones, 2008).

3.2 Effect of Reliable Electricity Supply on SME Operations

The most significant effect vulnerable supply of electricity has on small business' operations is cost. Cost is a variable input in the measurement of profit. Profit is only realisable where cost of production is less than revenue. As a fixed cost therefore, SMEs' access to sufficient and affordable supply of electricity is therefore a crucial determinant of profitability and growth. Low levels of infrastructural development and poor services can drive up firms direct and indirect costs and bias their technological choices away from energy intensive ones which in turn increase the overall cost relative to competitors in other regions. SMEs suffer operation and maintenance costs arising out of power fluctuations (Lai et al., 2008). Haanes et al., (2011) identified *"reduced costs due to energy efficiencies"* as the second highest possible source of sustainability next to improved brand reputation. In other words, the higher the frequency and longer the duration of interruptions, the greater the cost incurred by small businesses and vice versa and lesser or greater their ability to sustain their business interests.

The Centre for Policy Analysis (CEPA, 2007) identified that the 2007 power rationing exercise in Ghana resulted in increased local manufacturing costs. Velasquez and Pichler (2010) also reiterated that sufficient and *affordable* supply of energy (in this case, electricity) has had a decisive significance for economic activities and economic growth can or may be restricted by resource energy. Since a country's economic growth is a composite of economic activities of small and medium enterprises, the less cost they have to tolerate, the better a country's chance at harnessing their input towards greater levels of gross domestic product and growth. Okpara (2011) consents that; SMEs can contribute immensely towards economic growth and poverty reduction.

Another effect of power fluctuations on businesses is related to their level of competitiveness. Arinaitwe (2006) has revealed from his research that the rate at which SMEs fail in developing countries is higher than in the developed world. Irjayanti and Azis (2012) in their research found that as a result of the free market system, Indonesian SMEs were fighting stiff competition from foreign products and firms who have the ability to produce better quality products. In their research, they found that high cost of energy accounted for 62% of respondents' identification of barrier factors against Indonesia SMEs. A research carried out by Data Bank Ghana Limited, a research and investment company in Ghana, estimates that, Ghana's economy could lose about 1.4 billion dollars due to the impact of electric power crisis on the manufacturing, services and informal sector of which SMEs play a very pivotal role. Therefore, to forestall these loses there is urgent need to better structure the production and distribution of electrical power so as to enhance our chances of growing the economy and achieving the goals of any development initiatives.

In another study by Alam (2013) which sought to identify the relationship between electric power consumption and foreign direct investment, the researcher found out that there was causality for electric power consumption and foreign direct investment as well as economic growth. Alam (2013) therefore recommended a policy framework that will ensure that there will be a continuous supply of electricity in order to make advances in economic growth. Studies connecting power fluctuation to profit are fewer as most studies tend to consider the entire gamut of related factors that inhibit the performance of SMEs. For instance, the Confederation of Tanzanian Industries (CTI) argues that Tanzania's manufacturing sector also experiences unreliable, inter-

mittent power supply, frequent rationing and outages and such occurrences cause manufacturers to experience poor service quality, unplanned power stoppages and interruptions, voltage fluctuations, phase failures and unbalanced voltages (CTI, 2011).

Burlando (2010) also identified that a month-long blackout in Zanzibar in Tanzania caused a large decline in household income among those employed in occupations that required electricity. Workers relying on electricity had to reduce work hours by an average of 8% per day during the blackout period (Burlando, 2010). The August 14, 2003 blackout that occurred in New York, Michigan, Massachusetts, Ohio, New Jersey, Connecticut and Vermont all in the United States of America, caused an estimated loss of $6.4 billion (Anderson & Geckil, 2003). In another study conducted in Indonesia, it was revealed that among the many barriers to SME development supply and price of reliable electricity was mentioned by 62% of the 180 respondents as being a major barrier to SME development (Tambunan, 2009). In the same research report, high production capacity deficiency, limitation in sales and high labour costs accounted for 21%, 36% and 18% respectively. In a another study in Indonesia, it was found that SME sector account for 99% of businesses in Indonesia making them the most significant contributor to Indonesia's economic development (Irjayanti, Maya and Azis, Anton Mulyono, 2013). Other studies by Wang (2002) on outage costs and strategy analysis of the hi-tech industries revealed that production process spans weeks and sometimes months in planning and execution. A slight variation in the load of supply can therefore render the objects they produce obsolete. Wang (2002) further revealed that a power interruption lasting between 1 and 4 seconds can result in a loss of more than US$ 3 to 10 million of damage to their properties.

4. METHODOLOGY

This study is a causal study deploying a mixed method approach for the gathering and analysis of data. A total of 450 formed the population for the study, representing the total number of SMEs within the Accra Business District which use electrical power as core resource for their businesses. A multi-sampling method was used to arrive at the study sample. Firstly, a purposive sampling technique was used to select all SMEs that rely on electric power as a key resource for their business. A total of 450 SMEs were identified out of which 70 were selected. The procedure for the selection of the sample of SMEs was as follows. Firstly, the population (450) was divided by the sample size (70) arriving at 6.428 (approximated to 7). Secondly, a systematic sampling technique was then used to select the 7th element from the range of the population. A self-administered small business questionnaire (SBQ) was used to collect primary data from 70 SMEs within the business district of Accra, Ghana. Because the questionnaire was interviewer-administered, all 70 were retrieved signifying a success rate of 100%. SPSS (version 17) was used to analyse the data. Associations between the power outages and various profitability ratios were examined and a correlational analysis was used to analyse the data collected.

5. RESULTS AND DISCUSSIONS

The results of the research confirmed that power outages made significant impact on SMEs in various ways. Of the total number of 70 surveyed, 30 of them were service providers repre-

senting 43%, 9.8 of them were manufacturers representing manufacturers, 25.2 of them were retailers, representing 36% and the remaining 7% were distributors. Respondents were asked to indicate the area of their business they use electricity. The results are shown in Tab. 1.

Tab. 1 - Use of electricity in business. Source: Survey data, 2014.

	Number	Percent %
Production	24	34.3
Storage	20	28.6
Display	26	37.1
Total	70	100.0

Tab. 1 above indicates that without exception, all the research subjects rely heavily on electricity to provide goods and services to their clients. 34.3% used electricity for production purposes, 28.6 used it for storage and 37.1% used it to facilitate the display of their products and services to attract potential customers. As a sample of the wider SME population, the effects of fluctuations in power supply implies analogous effects on all SMEs and therefore the effect of power fluctuations on SMEs will have colossal negative synergic effect on the nation's development and sustenance because a country's economic growth is largely dependent on the aggregate of small businesses within its markets.

The study investigated the frequency of power fluctuation experienced by the subjects in the study. The findings are depicted in Fig. 1.

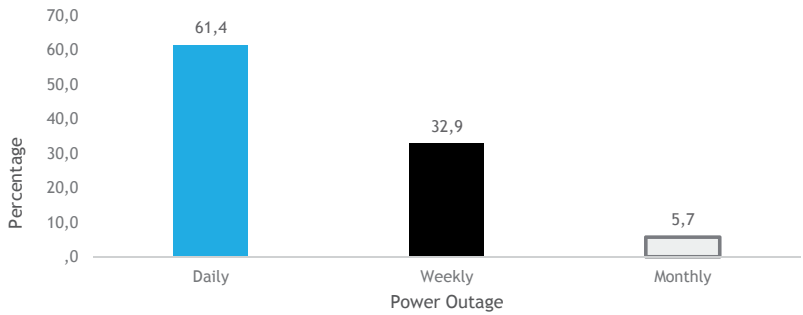

Fig. 1 - Frequency of power outages. Source: Survey data, 2014.

Out of the 70 SMEs, 61.4% experienced fluctuations daily whiles 32.9 experienced fluctuations once a week. The businesses who suffered losses as a result of the fluctuation are in the majority. As reported in the findings of Burlando, (2010), 8 hours of work is lost every day from fluctuation. This means 42.98 of businesses will lose cumulative amount of 343.64 man-hours each day. Fig. 1 when factored by the number of businesses in other sectors of the economy and cities implies a colossal loss of productive hours resulting in shrinkage of Ghana's gross domestic product but more specifically losses of revenue for the individual businesses leading to job and livelihood losses to both owners and employees. Other areas where the SMEs are likely to be affected by the daily

experience of fluctuation include high production capacity deficiency, limitation in sales and high labour costs (Irjayanti and Azis, 2013) and damage to their properties (Wang, 2002).

Respondents were asked to indicate their output per week during periods of constant power and periods when power is not consistent. The results are shown in Tab. 2

Tab. 2 - Output of SMEs per week when there is constant power and when power is not consistent. Source: Survey data, 2014.

When power is consistent			When power is not consistent		
Units	Frequency	Percentage	Units	Frequency	Percentage
0	Nil	-	0	10	14.28
1-50	50	71.42	1-50	40	57.14
51-100	14	20.0	51-100	16	22.85
101-500	3	4.28	101-500	3	4.28
501-1000	2	2.85	501-1000	1	1.42
1001-2000	1	1.42	1001-2000	0	0
Total	70	100	-	70	100

In Tab. 2, the total number of SMEs that produced between 1-50 units when power was consistent fell from 50 to 40 with 10 SMEs producing 0 units when power was not consistent. Similarly, the category of SMEs that produced 501-1000 and 1001-2000 units per week when power was consistent, reduced by 1 each when power was not consistent. This fall in production reflects a huge fall in profits for those categories of SMEs. This is because, all things being equal, sales should result in profit and where sales is zero, then profits are erased. On the whole, a fall in production results in decreased sales and consequently reduced profit margins for a firm.

Furthermore, respondents were asked to indicate the number of clients they are able to serve per week during periods of consistent and inconstant power supply. The results are shown in Tab. 3.

Tab. 3 - Total number of clients served with and without power. Source: Survey data, 2014.

Clients served in a week when power is consistent			Clients served in a week when power is not consistent		
Number of clients	Frequency	Percentage	Number of clients	Frequency	Percentage
0-50	NIL	-	0-50	17	24.25
51-200	37	52.85	51-200	33	47.14
201-400	13	18.57	201-400	10	14.28
401-800	10	14. 28	401-800	7	10
801-1000	10	14.28	801-1000	3	4.26
Total	70	100.0	Total	70	100.0

In terms of service delivery, when power was inconsistent, the numbers reduced considerably for the various categories but only increased among those who previously produced 0-50 signifying that delivery fell from other categories 51-200 (4), 201-400 (3), 401-800 (3), 801-1000 (7) as shown in Tab. 3 above resulting in an increased number of SMEs who produced between 0 and 50, thus 4+3+3+7. The combined reduction accounts for 24.25% reduction in service delivery.

5.1 Power fluctuation and the profitability (Return on Assets - ROA) of SMEs

The study examined the relationship between power fluctuation and the profitability (ROA). The results are found in Tab. 4 below:

Tab. 4 - Relationship between power fluctuation and profitability (Return on Assets - ROA). Source: Survey data, 2014.

		Return on Assets
Frequent power fluctuations	Pearson Correlation	-0.290*
	Sig. (2-tailed)	0.015
	N	70
Unannounced power outage	Pearson Correlation	-0.342*
	Sig. (2-tailed)	0.004
	N	70

Correlation is significant at the 0.05 level (2-tailed).

From the results in Tab. 4, it is seen that the correlation analysis carried out to ascertain the relationship between frequent (announced) power fluctuation and ROA gives a Pearson correlation coefficient of -0.290 and a significant value of 0.015. This means that there is a significant negative relationship between frequent (announced) power fluctuation and ROA. Also, there was a significant negative relationship between unannounced power outage and ROA. This was significant at 0.05 significant level as the p-value ($r = 0.004$) is less than 0.05. This implies that the more frequent the power fluctuations, the lower the ROA of SMEs.

5.2 Power fluctuation and the Return on Investment (ROI) of SMEs

The study sought to examine the relationship between power fluctuation and ROI. ROI is a fallout from the level of the firm's profitability, meaning that, if the firm is profitable, there is should have a positive ROI for economic development. The results are found in Tab. 4 below:

Tab. 5 - Correlations between Power fluctuations and Return on Investment (ROI). Source: Survey data, 2014.

		Return on Investment
Frequent power fluctuations	Pearson Correlation	-0.399*
	Sig. (2-tailed)	0.001
	N	70
Unannounced power outage	Pearson Correlation	-0.268*
	Sig. (2-tailed)	0.025
	N	70

*. Correlation is significant at the 0.05 level (2-tailed).

From the analysis in Tab. 5, it was found that, the correlation analysis on the relation between frequent (announced) power fluctuation and ROI gave a Pearson correlation coefficient of -0.399 and a significant value of 0.001. This means that there is a significant negative relationship between frequent (announced) power fluctuation and ROI. With regards to unannounced power outages, the study also found significantly negative relationship with ROI. The Pearson correlation calculated was -0.268 at a significance level of 0.025. This was significant at 0.05 significant level as the p-value ($r = 0.025$) is less than 0.05.

The negative correlation between frequent (announced) power fluctuations and unannounced power outages with ROA and ROI, confirms the assertions by Wang (2002) that the costs of alternate power sources such as power generators, as well as expenditure on overtime pay to staff and outsourcing service cannot be avoided when there is power outages and that tends to affect the firms ROA and ROI. Also, like Lai, Yik and Jones (2008) explain, unannounced power outages tend to damage equipment's generates high quantities of semi-finished goods which eventually affect product quality. Furthermore, the costs incurred in repairing equipment's, the delays or cancelations in the delivery of orders are borne by SMEs and that increases the operation and maintenance costs. This implies that the more frequent the power fluctuations are, the lower the ROI of SMEs (Lai, Yik and Jones, 2008). If these SMEs are not able to make enough profits that are not able to make further investment in their business. They may fold up or their contribution to the Gross Domestic Product (GDP) of the country will decrease if they continue to operate.

5.3 Cost of alternative source of power and the competitiveness of SMEs

For most SMEs, power outage does not mean stoppage in production as their ability to produce and sell brings income for self-sustenance. Therefore, the need for alternative sources of energy becomes more apparent. The study explored the proportions (in %) of the various sources of energy and the perception of respondents on the cost of such alternative energy sources. Also of interest was the sundry costs incurred on alternate source of power. From Fig. 2, it is indicated that generator constitutes the largest proportion (66%) of the alternative sources of power. This is followed by rechargable lamps (20%), kerosene lanterns (10%) and solar panels (4%).

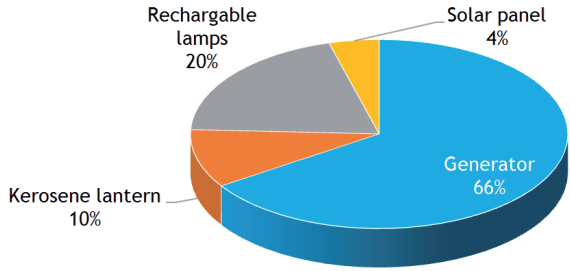

Fig. 2 - Alternate sources of power. Source: Survey data, 2014.

The study examined the perception of SMEs on the cost of alternative sources of power. The findings were emphatic as a total of 83% of respondents were of the view that, these alternative sources of power though necessary to keep their business running are generally every expensive. However, 9% of respondents were of the view that the cost of the alternative sources of power are equivalent to the traditional power sources whiles 8% explained that the alternative sources of power are cheaper. The findings are depicted in Fig. 3.

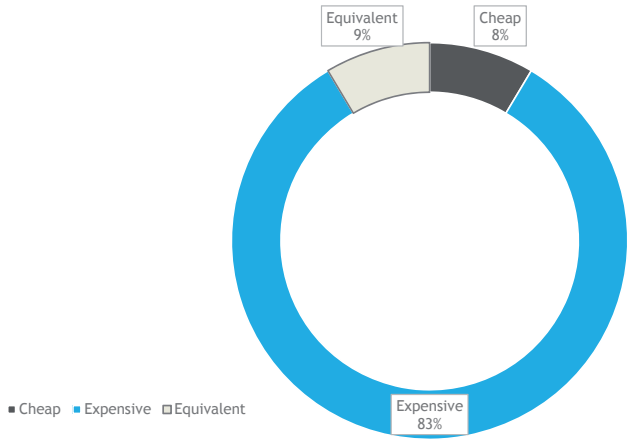

Fig. 3 - Cost of alternate power source. Source: Survey data, 2014.

After these alternative power sources are procured, there are some cost incurred in the maintenance of the equipments. Such cost are known as sundry cost. From Fig. 4, it is seen that the largest componet of the sundry cost went into the replacment of the equipment (44.3%). The other componnets of the sundry cost were into repairs (28.6%), trasnportation cost (25.7%) and the cost of technicians (1.4%). The frequency distribution is shown the Fig. 4.

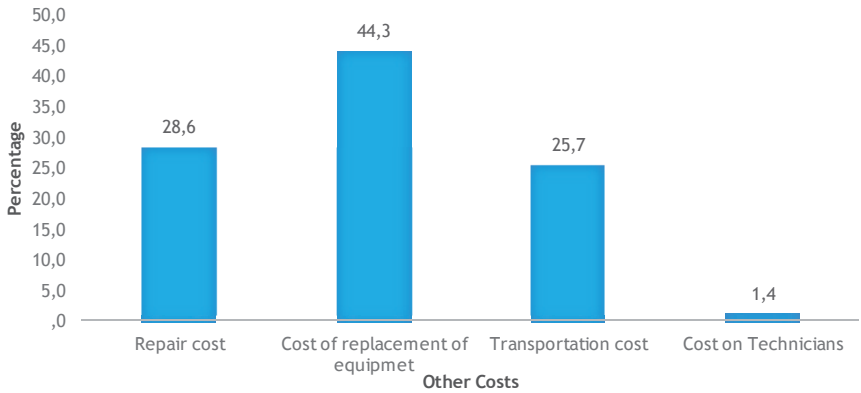

Fig. 4 - Sundry costs incurred on alternate source of power. Source: Survey data, 2014.

Fig. 2, 3 and 4 above indicate that the use of Generator accounts for 66% of the coping strategies of SMEs surveyed in this study resulting in an increasing cost of energy particularly operation and maintenance cost (O&M Cost), 83% of respondents considered alternate sources of energy to be expensive. O &M costs are mainly in the area of energy, outsourcing of repair services and replacement of deteriorated parts of equipment (Lai et al, 2008). Thus, Total Energy Cost (TEC) incurred will be the sum of Outsourced service Cost (OC) plus Maintenance Cost (MC) plus replacement Cost (RC) and Energy Cost (EC).

$$TEC = \sum OC, MC, RC \& EC.$$

If the supply of electricity was reliable and adequate, SMEs would avoid OC, RC and MC. The additional costs incurred (OC, RC and MC) further increases the expenditure of the SMEs and causes attrition in profit. One way of dealing with the added operational cost is to pass on the cost to the ultimate consumer. However, in doing so, a firm becomes less competitive in prices especially against products and services of foreign firms who may operate under different or better energy conditions in their home country and may lose their clients to their competitors. The cost of repairs and replacement can also have adverse effects on a firm's ROA thus reducing their profit margins significantly. The key performance indicators of profit generally include a positive ROA, positive ROI and a positive equity ratio. Where the ratios are negative, the profitability of an entrepreneurial activity by SMEs is therefore negative.

5.4 Effect of power fluctuations on the expenditure patterns of SMEs

The study analysed the effect of planned and unplanned power fluctuations on the expenditure patterns of SMEs. The results are indicated in the Tab. 6 below.

Tab. 6 - Effects of power fluctuation on expenditure. Source: Field data (2014).

Responses	Frequency	Percentage
Lose of money when the light goes off	9	12.9
Low productivity and profit	9	12.9
negative effect	8	11.4
Increases the cost of production	9	12.9
Rising expenditure and high cost of production	9	12.9
Increases expenditure	26	37.1
Total	70	100.0

Tab. 7 above is a summation of the varying perceptions of survey subjects on the effect of power fluctuation on their businesses. Of the 70 respondents, 44 of them representing 62.85% cited increased expenditure as the effect of power fluctuation on their businesses whiles another 18 out of 70 representing 25.71% also cited decreased revenue as effect of power fluctuation on their businesses. The combined results (more expenditure, less revenue) therefore indicate that power fluctuations have a negative effect, reflecting in the area of profit, on the operation of their businesses.

6. FINDINGS AND CONCLUSIONS

Results from this study reveal that, SMEs in Ghana and particularly in Accra, suffer from frequent power fluctuations (announced and unannounced), and these fluctuations have adverse effects on their ROA and ROI thus leading to losses in profit. The main areas affected by the fluctuations are production, storage and service delivery. The costs incurred include increased expenditure on alternate sources of power, increased costs in outsourced repair services and cancelled orders due to delays. It is found in this research that unplanned/ unannounced as well as planned/announced power fluctuations had same effects on the profitability of the SMEs surveyed. This research agrees however with Wang (2002) and several other researchers that both intermittent and frequent power outages cause severe harm on SMEs profitability. By focusing on SMEs, this study contributes to the body of knowledge on the profitability and competitiveness of SMEs in the global business environment. This work therefore contributes to the debate on issues that bedevil Africa's economic development by highlighting the micro issues that build up into delays or encumbrances in local economies and ultimately its impact on Africa's economic advancement.

The research concludes that, competition in international markets as well as against local competitors depends on SMEs competitive advantage (Irjayanti and Azis, 2012). However, high energy cost, irregular energy supply, lack of technology; non-competitive prices have been cited in several works as the causes of SMEs inability to compete effectively (Wang, 2002; Irjayanti and Azis, 2012). Availability and reliability of electric power supply is crucial for the adoption of appropriate technology and the latter is sine-qua-non for increased levels of productivity

and quality. Without suitable technology, high-tech dependent firms (such as internet café's) are unable to produce in increased quantities and quality leading to poor sales hence low levels of profitability. Consequently, they are unable to compete effectively. This cyclical pattern, thus, low profits leading to inability to acquire appropriate technology resulting in poor quality and lowered production, affects the SMEs competitiveness. Therefore, the levels of profitability of SMEs can act as a competitive tool. If the level of profitability is high, it is expected that the level of competitiveness will be high since the ROA and ROI will be high and vice versa. The findings of this study confirm the relevance of electricity and energy resources in enhancing the competitiveness of businesses, particularly those in developing countries. If SMEs are to contribute to economic growth and development of the country, then it is essential for them to access reliable energy at an affordable cost because energy is a necessity to their operations and productive capacity.

7. RECOMMENDATIONS

The findings from this study have tremendous significance for policy development and economic analysis. Most debates focus on macro issues to the neglect of the micro issues such as the effect of major government policies and corporate strategies on players in the SME sector especially the ones that do not catch the attention of policy makers. The study recommends that regulatory bodies responsible for the energy sector must set some standards for the generation, distribution and costing of electric power where preference would be given to key sectors of the economy such as SMEs since they are known to provide jobs for a large number of people and contribute significantly to the economic growth of the country. Standards in the distribution of power are also critical to ensure continuous supply of power to industries. Two approaches for setting standards are recommended. Firstly, there is a need for the setting of a penalty for each standard power distributor that does not meet the required supply level agreed. Such penalties would be effective if they are compulsory and automatic (Waddams et al., 2002). Secondly, it is essential to create incentive scheme to reward power distribution companies' that ensures the standards are being maintained and also eliminate the waste in energy supply (Bowdery, 1994).

For quality in generation and distribution to be maintained, it is essential to adopt four main operational mechanisms. They are the requirement to publish measures of quality; the measure of quality in the price-capping formula (RPI-X þ Q); the setting up of customer compensation schemes; and the specification of the minimum standards and back them with legal consequences (Rovizzi and Thompson, 1992). There is also a need for an opening of the market for greater competition in the supply and distribution of power. Increase in the levels of competition would yield quality and efficiency in supply and service delivery. Since 1957 till date, the electricity supply market has not been opened up to competition. It has been dominated by a state monopoly, Electricity Company of Ghana. However, a more competitive environment, where features such as price, efficiency and service quality would characterise the criteria for operation would contribute to the reliability in power supply.

8. SUGGESTIONS FOR FURTHER RESEARCH

It will be useful to conduct longitudinal research into the long-term effects of electrical power outage on the profitability and competitiveness of firms. The longitudinal research could use a multiple regression analysis with power fluctuation as an independent variable and the competitiveness and profitability of SMEs as the dependent variable. This will provide a strong predictive trend and draw conclusions on the relationship between the variables. In such a study, the sample size could be increased to strengthen the outcomes of findings. Since this research is based on a section of SMEs operation in the Accra business district, it will be useful to extend the study to other regions in the country to observe the trends for comparative analysis.

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