Assessing the Effects of Load Shedding (DUMSOR) on SMEs and the Coping Strategies Used to Survive Load shedding in Madina, Accra.

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By

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Thesis submitted to the Department of Business Administration, Ashesi University College. In partial fulfilment of the requirements for the award of the Bachelor of Science degree in Business Administration.

APRIL 2016

DECLARATION

I hereby declare that this thesis is the result of my own original work and that no Part of it has been presented for another degree in this university or elsewhere.

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I hereby declare that the preparation and presentation of the thesis were

Supervised in accordance with the guidelines on supervision of thesis laid down by Ashesi University College.

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ABSTRACT

The availability of electricity is an important factor for the improvement of any economy. However, the unreliable supply of electricity in Ghana, has led to several periods of electricity load shedding. This negatively affects the operations of businesses, especially Small and Medium Scale Enterprises (SME). In Madina, a suburb of Accra, businesses seem to be surviving the effects of the current load shedding exercise (called "dumsor" in the local Twi language). The objectives of this study were to investigate the effects of the recent load shedding exercise on SMEs in Madina and what they are doing to cope with the effects.

The research design employed was explorative and used quantitative and qualitative data obtained through the purposive, non-probabilistic sampling of 31 SMEs located in Madina. Content and graphical analyses were used to analyse the data.

Results indicated that the load shedding of electricity negatively affects the operations and growth of SMEs. The negative effects included increase in operating cost; loss of production time; loss of revenue; decrease in productivity; damage to plant equipment; increased expenditure; reduction in labour force and overnight work. The coping strategies businesses adopted to minimize the negative effects included: electric generators, reduction in labour force, early closure, solar power, uninterrupted power supply, power banks, inverters and voltage stabilizers.

Given the contribution of SMEs to the economy and the significant negative impact load shedding has on their operations, Ghana's growth will be stifled if the problem of load shedding is not permanently resolved.

Keywords: load shedding, coping strategies, SME, Madina, electricity

LIST OF ACRONYMS

Acronym	Meaning
ECG	Electricity Company of Ghana.
SME	Small and Medium Scale Enterprises or Businesses.
GDP	Gross Domestic Product.
NBSSI	National Board of Small Scale Industries.
VRA	Volta River Authority.
IPP	Independent Power Producers.
MOE	Ministry of Energy.
GRIDCo	Ghana Grid Company Limited.
EC	Energy Commission.
NEDCo	Northern Electricity Department Company Limited.
PURC	Public Utilities Regulatory Commission.
MBD	Madina Business District.
UPS	Uninterrupted Power Supply.

DEFINITION OF TERMS

Electricity: The form of energy resulting from the existence of charged particles used to operate a large variety of machines, gadgets, equipment, lights, and other electrical appliances.

Load shedding of electricity (Load shedding): The deliberate shutdown of electricity in a part or parts of an electricity distribution system in order to prevent a failure of the whole power system when there is excess demand over supply. . It is popularly called “Dumsor” in Ghana. Dumsor means “switch it off and then on” in the local Twi language.

Coping Strategies: Measures put in place by businesses to minimize the effects of the load shedding of electricity on their operation to prevent them from collapsing as a result of these effects.

Employment: The arrangement between an employee and an employer, where the employee provides services to the employer in return for some form of compensation usually wages.

Employment arrangements: The agreement between an employer and an employee concerning factors that determine the terms of employment. These are factors such as the number of hours worked by the employee, the working hours and working days among others.

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CHAPTER 1. INTRODUCTION

Background

Electricity is a multitalented energy currency that underpins a wide range of products and services which improve the quality of life, increases worker productivity and encourages entrepreneurial activity (Adom, 2011). Therefore, access to electricity typically spurs economic growth and development. Consumption of electricity is positively correlated to the real per capita Gross Domestic Products (GDP) of most countries. According to Adom (2011), between 2000 and 2008 when electricity consumption grew by 1.21%, the GDP of Ghana also grew by an average of 5.5% per annum.

The availability of electricity is widely regarded as a propelling force behind economic activity and industrial production (Onyakoya, Onyakoya, Jimi-Salami, & Odedairo, 2013). Therefore, the importance of electricity in any economy cannot be exaggerated. This is because most sectors such as health, construction, entertainment, manufacturing, education and communications significantly depend on the production of electricity for their activities (Ackah and Takyi, 2014).

In the year 2000 for example, the electricity sector contributed 10.21% to the industrial GDP of Ghana (Adom, 2011). According to revised 2014 GDP figures published by the Ghana Statistical Service, in 2014, 2013 and 2012, the electricity sector contributed GHc443 million, GHc393 million and GHc332 million respectively to the Ghana's GDP. In $US dollar terms, the contributions of electricity to the GDP of Ghana from 2012 to 2014 were $174233600, $167056440 and $138760890 respectively as illustrated in table 1. These figures represent a decrease in the

contribution of the electricity sector to GDP from 2012 when the recent electricity crisis started.

Table 1: The total consumption of electricity in Ghana and the contributions of electricity to GDP adjusted for in $USD.

Year	Total electricity consumed in billion kilowatts	Contribution of electricity to GDP in USD ($)
2012	6.06	$174233600
2013	6.12	$167056440
2014	5.31	$138760890

Source: Ghana Statistical Service.

When there is a failure in electricity production and distribution customers have no access to power, and major stakeholders in the economy such as private businesses are negatively affected. For example production costs rise as people turn to generators for power.

Reliable electricity production, transmission and distribution significantly impacts SMEs in densely populated regions of developing countries such as Ghana because it is critical to their operations. According to the Ghana Statistical Service (GSS), small scale enterprises refer to firms with less than 10 employees while medium scale enterprises refer to their counterparts with more than 10 employees.

Ghana's economy which is now dominated by the services sector is hungry for more electric power. In fact, the service sector has now taken over from agriculture as

the leader in Ghana's real economy and as at 2014, the service industry contributed 49.6% to the GDP of the country (Ghana Statistical Service , 2015).

As at 2014, the population density of Ghana was estimated to be at 118 people per square kilometre of land. Majority of Ghana's population is located in the cities as result of high and increasing rural-urban migration. The high population density in city therefore puts upward pressure on the demand for the services of SMEs such as cold stores, barbershops, hair-styling boutiques, and in turn such SMEs consume more electricity.

Like Ghana's capital city, Accra, cities in many developing countries are often characterized by densely populated business enclaves that deliver different basic services usually in the informal sector. Examples of such businesses include: barbershops, hair-styling boutiques, cold stores, drinking bars and food joints, metal and electronic signboards services, printing and photocopying shops, internet cafes, repairing and cell phone charging centres, car painting and body repairs centres and fridge and TV repair shops. Madina, a suburb of Accra is a good example of the type of business enclave described and was chosen for this research.

Madina is located in the La-Nkwantanang- Madina Municipal Assembly, a suburb of Accra in the Greater Accra region of Ghana. Apart from hosting a large market, the area is home to a wide range of businesses such as financial institutions. The area also contains a large number of SMEs like cold stores and hair dressing salons.

Madina was chosen for this research because, it is home to a wide range of organised SMEs from which appropriate data can be obtained for the study. The Madina area also provides employment for a large number of people staying in Accra and beyond. Therefore, enough data can be collected from this area to be used in the

research. In addition to this, there have been several demonstrations by workers and business owners in and around the Madina area about the impact of the on-going load shedding activities on their businesses. The demonstrators typically carry placards that read “"Won Gbo” (meaning - We are dying - in the Ga language) (Akwei, 2015).

Though these traders and business owners never explain how exactly the load shedding is impacting their businesses, the general assertion is that the load shedding has a negative impact on them. It thus makes sense to explore the different ways in which load shedding impacts the businesses of such traders and SME operators.

Also interesting is the fact that, many businesses in Madina are surviving the load shedding despite the power crisis and the uproar it created in Madina and Ghana as a whole. This can be attributed to some measures the business owners and managers put in place in order to continue their operation. For this reason, SMEs in Madina were selected for this research in order to document what these businesses are doing to cope with the effects of load shedding. The trend in employment since the load shedding of electricity was also studied. This is because the load shedding of electricity may affect the productivity whiles increasing cost and decreasing revenue hence some businesses may be forced to decrease the number of people they employ.

Picture 1: Madina Business Centre in Accra

Source: Google Images

Picture 2: Thriving Business Activity in Madina

Source: Google Images

Definition of Operational Variables

Two major operational variables were used in this research:

Independent Variable

Load shedding of electricity.

The term load shedding of electricity used in this thesis refers to the deliberate shutdown of electricity in a part or parts of an electricity distribution system (Dictionary.com Unabridged, 2015). Load shedding is done to prevent a failure of the whole power system when there is excess demand over supply.

According to Abou, Zein and Spea (2006), the load shedding of electricity is done as a last resort in the case in which there is a deficiency in the generation and supply to electricity to prevent system failure (Abou, Zein El-Din, & Spea, 2006).

Load shedding, or load reduction, is sarcastically named "Dumsor" in the Local Twi language. It means "off and on", and is done countrywide. Research has shown that the load shedding of electricity is done as a controlled option to protect the electricity power system from a total blackout (eskom.co.za, 2015)**.**

Dependent Variable

Coping strategies

This refers to the measures put in place by businesses to survive the effects of the load shedding of electricity. This includes what they do in order to decrease cost and improve their efficiencies.

Problem Statement

Electricity plays a key role in economic growth and development. For example, it increases foreign earnings when products manufactured using electricity are exported. Electricity also generates employment in industries and facilitates improvement in infrastructure (Onyakoya, Onyakoya, Jimi-Salami, & Odedairo, 2013).

However, the current power crisis in Ghana has led to the load shedding of electricity, throughout the country with negative consequences for businesses. Business owners do not get the necessary supply of electricity needed to operate their jobs effectively. For example, as a result of the current power crisis, electricity is off for 24 hours and on for 12 hours. Therefore, business owners either have to find alternative coping mechanisms like using generators or remain redundant during electricity outages (Braimah and Amponsah, 2012).

The load shedding of electricity by the Electricity Company of Ghana (ECG) is likely affecting the businesses and their owners in several publicly unknown (and known but undocumented) ways. This research therefore aims to document such effects and the coping strategies that have evolved to mitigate the negative effects of the crises.

Research Questions

1. What are the effects the current load shedding of electricity in the country is having on small and medium scale businesses located at Madina?
2. What are these businesses doing to cope with these effects?

Research Objectives

1. To determine the effects the load shedding of electricity is having on small and medium scale businesses in Madina.
2. To investigate and document the measures businesses are using to cope with these effects of load shedding.

Relevance of the study

The recent load shedding of electricity has gained popularity in the Ghanaian media over the past year and has been at the centre of a number of public debates which have been aimed to find the causes, effects and solutions to the electricity crisis.

In addition to this, public demonstrations like the “Dumsor Must Stop Vigil” have been held and during these demonstrations, various business owners or citizens complained using such strong words as “'Won Gbo (meaning - We are dying - in the Ga language)” (Akwei, 2015).

The “Dumsor Must Stop Vigil” was a demonstration held on May 16th 2015 where people from all walks of life in Ghana gathered to hold a peaceful demonstration against the continued and extensive load shedding in the country (Anangfio, 2015). The aim of the demonstration was to send a message to the government to deliver on its promise of ending the load shedding of electricity. This illustrates how seriously Ghanaians view this issue.

However, although these businesses complain that the load shedding is collapsing their businesses, most businesses, especially in the Madina area, still remain in business. Therefore, this research investigated measures the businesses put in place which prevented them from collapsing. This information will be useful to businesses in other parts of the country suffering from the load shedding exercise as well as businesses in other African countries who may suffer from load shedding in the future. In addition to this, because of the importance of electricity to businesses, load shedding may affect the employment of workers, so information about the effects of the electricity crisis on employment in these businesses will be valuable to Ghana’ policy makers.

This research is also pertinent because it will assist the government and policy makers to understand the exact problems being faced by the people during “Dumsor” in order to help put measures in place to help the people of the country. The research contributes to the literature on the effects of the power crisis by focusing on Madina

and using recent data to analyse, the coping strategies of businesses against the effects of load shedding.

CHAPTER 2. LITERATURE REVIEW

A discussion of theories on the electricity growth relationship

Over the years, there have been valid theoretical arguments about the relationship between electricity and economic growth. Research in different countries has found different results on the relationship between energy and growth. Four contradicting schools of thought can be identified under the literature on the relationship between energy and growth.

On one hand, some theorists contend that there is a unidirectional causality from growth to electricity consumption and supply (Ozturk, 2010). This is also referred to as the "conservation hypothesis" because it suggests that conservation energy policies implemented may have no effect on economic growth (Ozturk, 2010). There is thus a unidirectional effect of growth on electricity. In order words expanding economies tend to have the finances to produce more electricity with zero feedback from electricity production to growth due to energy conservation efforts.

This hypothesis is said to be true in cases where an increase in growth causes an increase in energy consumption. For instance, Zhang and Cheng (2009) found that there is a unidirectional relationship from growth to energy (electricity) consumption in their study to determine the relationship between energy consumption, carbon emissions, and economic growth in China (Zhang & Cheng, 2009).

On the other hand, some theorists suggest that there is a unidirectional causality running from energy (electricity) consumption to economic growth. This is also referred to as the growth hypothesis (Ozturk, 2010). It suggests that decrease in the supply of electricity (energy) will negatively affect economic growth while an increase in electricity or energy consumption will positively contribute to growth. The theory

implies that electricity consumption complements labor and capital and plays a role both directly and indirectly in the process of production. Therefore the supply and consumption of electricity or energy is important to the growth and GDP of a country. For example, Glasure (2002)'s research to determine the relationship between GDP and energy in Korea found that energy consumption and supply led to an increase in GDP (Glasure, 2002).

Other theorists suggest that there is a bi-directional causality between energy and growth. This theory is also referred to as the feedback hypothesis (Kwakwa, 2014). The theory suggests that both energy consumption and growth are jointly determined and affected at the same time. It implies that GDP and energy or electricity are simultaneously determined and have a positive effect on each other. An increase in energy supply and consumption will lead to an increase in growth and an increase in growth will lead to an increase in energy (electricity) consumption and supply of energy.

Last but not least, some theorists suggest that energy or electricity consumption are independent of each other (Kwakwa, 2014). This is also known as the as neutrality hypothesis. This theory implies that energy and GDP have no correlation with each other. This means that no matter the level of electricity consumption or electricity supply, there will be no effect on growth. According to this theory there is no causal relationship between energy (electricity) and growth. For instance in study to determine the relationship between electricity consumption and growth in Turkey in 2004, Altinay and Karagol found there was no causality between energy consumption and growth (Altinay & Karagol, 2005).

The above theories all mention the possible relationships between gross domestic product (GDP) and electricity supply and consumption. In determining these effects, small and medium scale enterprises in Ghana have to be taken into consideration. This is because they make a significant contribution to the gross domestic product of developing countries and to Ghana in particular. For example in 2014, SMEs contributed 70% of Ghana's GDP (Myjoyonline.com, 2014). The survival of SMEs is clearly important to the growth of Ghana, therefore any factor –such as load shedding- that undermines their functions deserves careful scrutiny.

The uses and importance of electricity in businesses

Electricity is an important form of energy which is widely used in all parts of the world and has been identified as a key element for economic growth. Forkuoh and Li (2015) investigated the relationship between electricity outages and SME growth in the Asafo Market area of the Kumasi Metropolitan Assembly in Ghana. They employed both qualitative and quantitative approach in obtaining data from 250 cold store operators located in the Asafo market. Results obtained from analysis of their data showed that power outages have a negative impact on the growth of SMEs.

According to Forkuoh and Li (2015), the electricity outages being experienced in Ghana affects the production and sales of SMEs through increased production cost; high cost of alternative power and damages to assets resulting in decreased sales for these SMEs (Forkuoh & Li, 2015). Due to the increased operation cost, businesses use revenue for servicing of electricity and alternative power bills instead of reinvesting greatly undermining their performance and growth (Forkuoh & Li, 2015).

Over the years, a lot of research has gone into determining the effects of electricity outages on businesses. Given the uses and importance of electricity to businesses, the

load shedding exercise may cause businesses to experience significant negative effects. However, despite the negative effects of load shedding, businesses continue to run. Therefore, one objective of this research is to contribute to the debate in the literature about the effect of electricity on SME performance by determining the measures businesses put in place to cope with the electricity crisis.

Why the need for electricity load shedding arises?

In an article to addresses whether or not a new intelligent based emergency power system control strategy should be adopted using the nonlinear simulation where the new load shedding scheme is compared to the conventional scheme me, Bevrani, Tikdari and Hiyama (2010) found that a new intelligent scheme for load shedding should be adopted.

According to Bevrani, Tikdari and Hiyama (2010), power fluctuations negatively contribute to power imbalances. Frequency and voltage deviations -in which significant disturbance may cause under or over frequency or voltage relaying also disconnect some lines. Hence the persistence of these unfavourable conditions may cause a cascading failure and system collapse (Bevrani, Tikdari, & T. Hiyama, 2010).

According to Bevrani and Hiyama (2010), load shedding is an emergency control action to ensure system stability by curtailing system load. Load shedding is only implemented when voltage falls below a specified voltage or frequency threshold like in the case of Ghana.

The process of load shedding is aimed at protecting the system against excessive voltage or frequency decline by real and reactive power supply and demand (Bevrani, Tikdari, & T. Hiyama, 2010). This implies that the past and present occurrences of load shedding being faced in Ghana were and are necessary to ensure that the whole power

system does not collapse because of its inability to generate up to a particular level of electricity needed to support demand in the country.

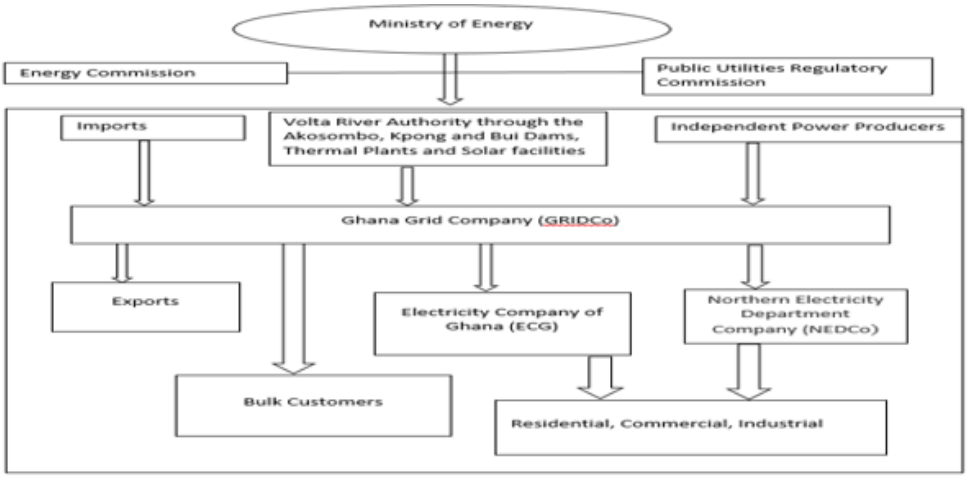
The Structure of Ghana's Power Sector

In Ghana the process of providing electricity to final users is divided into three steps respectively handled by four different autonomous companies. The first step is the generation of electricity which is mainly handled by the Volta River Authority (VRA) through the operation of mainly the Akosombo, Bui, and the Kpong Dams or hydro stations (Ackah, Ahali, Graham, & Adam, 2014). There are also a number of power plants both publicly managed by VRA and others privately managed by the Independent Power Producers (IPPs) like Shenzhen Energy Group (The Chronicle, 2015).

The second step involves the transmission of power from bulk plants to distribution lines and is done by the Ghana Grid Company (GRIDCo). The final step involves the distribution of electricity to the final consumers and is handled by the Electricity Company of Ghana (ECG) and the Northern Electrical Department Company (NEDCo) (Ackah, Ahali, Graham, & Adam, 2014).

NEDCo distributes electricity to the three northern regions, a major part of the Brong Ahafo Region and a few towns in the northern part of the Ashanti region of Ghana. The ECG is responsible for the distribution of electricity to the southern part of the country (Adjei-Mantey, 2013).

The electricity distribution system in Ghana



Source: (Kapika & Eberhard, 2013)

In the 1990's the electricity sector of Ghana experienced significant growth. The primary reason for this was the expansion of the national grid under the rural electrification programme and the upgrading of some urban electricity distribution networks (Adom, 2011).

The growth of the electricity sector has been hampered by periods of low supply of electricity within the country which has led to the load shedding of electricity. Therefore, Ghana, like many African countries, suffers from perennial energy crisis which has culminated in the loss of a significant amount of output in the country (Ackah and Takyi, 2014).

The load shedding in Ghana during the 21st century began in 2007 when the water level in the Akosombo Dam drastically fell to 235.24 feet which is below its required minimum operating level of 240 feet. The Akosombo Dam is the biggest supplier of electricity in the country with a maximum operating level of 278 feet of water, therefore, the reduction in the water level led to a decrease of electricity

generated by the VRA (The Chronicle , 2015). Consequently the sector experienced a negative growth of 17.4% during that year (Adom, 2011).

However, the problem was temporarily resolved later in 2008 and hence the supply of electricity increased and the sector began to grow at a positive rate again. The problem was resolved because the government increased investment in the electricity sector through the procurement of several diesel generating units, mine reserve plants and investment in the Tema thermal plants (Adam|, 2015).

In 2012 the problem of load shedding resurfaced in Ghana. According to an interview granted by Mr Seth Terkper, the current finance minister, and reported on the Ghana Business News website in 2015, the root cause of the load shedding was a result of the damage to the West African Gas Pipeline. The damage on the Pipeline was caused by the anchor of a Pirate ship which got caught up in the pipeline after the pirates tried to flee from the Togolese naval forces when attempting to board an oil tanker lying off the coast of Lome (Dogbevi, 2015). The damage in the pipeline reduced the pressure in the pipeline leading to suspension of oil deliveries to Ghana, Togo and Benin from Nigeria. Due to the decrease in the supply of the gas some power plants in Ghana which run on gas have not been able to resume operations. For example the Sunon Asogli Power station in Tema which provides about 200 megawatts of electricity for the country since the incident has not been able to operate due to the gas shortage (Agbenyaga, 2014).

Before its damage, the pipeline used to provide 123 million cubic feet of gas daily to supplement VRA's hydro-electricity generation by about 580 megawatts using terminal plants in Tema and Aboadze. Therefore the country has not been able to

receive this supplementary electricity since its damage hence leading to the load shedding of electricity (Agbenyaga, 2014).

On 5th March 2015, AllAfrica.com published an article that highlighted other causes of the power crisis which has led to the load shedding of electricity throughout the country. These articles attributed load shedding to inefficiencies and problems in the operations of the three hydro-electric dams: Akosombo, Kpong and Bui. They explained that the fall in the flow of water from upstream because of the construction of a Dam in Burkina Faso on an important source of water to the Volta Lake resulted in the low water levels in the 3 dams (The Chronicle , 2015).

Other reasons mentioned by the article were the insufficient supply of power from thermal power plants which are not functioning effectively because of gas shortage and lack of funds for VRA, GRIDCO and IPPs to maintain machinery or to buy new ones in order to increase supply of electricity. In addition, the article mentioned other reasons like the unwillingness of the government and VRA to pay the electricity debt of its institutions, the increase in the number of consumers over the years due to rural electrification projects, increase in population and the unwillingness of investors to invest in the energy sector (The Chronicle , 2015).

Investors are not willing to invest in the sector because of high taxes, unstable exchange rate, uncertainty of conditions with regards to economic indicators like high inflation and the lack of confidence in the ECG's ability to retrieve money from customers (The Chronicle , 2015). The article also mentioned that the lack of investors in ECG and NEDCo was as a result of its inability to collect debt from consumers like government agencies such as parliament, hospitals and majority of the tertiary

institutions (The Chronicle , 2015). These "customers" constitute a very huge proportion of sales and thus since they do not pay up ECG incurs losses.

The power crisis mostly affects the private businesses which are the major drivers of the economy (The Chronicle , 2015). This is because government typically ensures its own institutions get power first.

In a research paper to determine the causes and effects of the frequent unannounced electricity blackouts on the operation of micro and small scale industries in Kumasi, Braimah and Amponsah (2012) discovered that blackouts often rendered workers in companies which did not have alternative sources of power redundant. They argued that the power cuts undermined the growth and output of businesses because they still incurred the same labour cost while production shrunk. Businesses which had to find alternative sources of power were incurring extra cost of fuelling and maintaining generators increasing their cost of production. They concluded that interrupted power supply was bad for the growth of businesses and usually caused some businesses to collapse (Braimah and Amponsah, 2012).

Overview of the electricity supply system and the link to load shedding in Ghana

The government of Ghana through the Ministry of Power is responsible for electricity policy formation and implementation (Kapika & Eberhard, 2013). The regulatory oversight of the energy sector is undertaken by the Public Utility Regulatory Commission (PURC) and the Energy Commission (Kapika & Eberhard, 2013).

The country's electricity is first generated by the Volta River Authority and other independent power producers. This electricity is then transmitted to the Ghana Grid Company (GRIDCo). Next, the electricity is transmitted to the Electricity Company of Ghana (ECG), the Northern Electricity Department Company (NEDCo)

and some of it is exported to the 'Communate Eletrique du Benin' or the Electricity Company in Benin (Kapika & Eberhard, 2013). The electricity transmitted to the ECG and NEDCo is then distributed to bulk customers and individual consumers or industries (Kapika & Eberhard, 2013).

However as a result of the inefficiencies in the systems of these organisations and inadequate power generation by the Volta River Authority, the supply of adequate electricity within the country has failed to meet the demand, resulting in periods of power outages and the load shedding of electricity throughout Ghana.

Since 1987, Ghana has been hit by several major shortages in the supply of electricity which have been attributed to factors including the trends in climate change; the complacency in policy making and chronic avoidance of tough decisions in the energy sector and the erratic gas supply from the West Africa Gas Pipeline (Kwakwa, 2014). These power crises have led to frequent power outages, fluctuations and rationing throughout the country.

Ghana has experienced five major load-shedding exercises over the past three decades and constant unreliable power supply (Ackah, Ahali, Graham, & Adam, 2014). The first load shedding exercise after the construction of the Akosombo dam and the inauguration of the Volta River Authority occurred between 1983 and 1984 and was as a result of drought which caused a decrease in the water level of the Akosombo dam (Malgas, 2008).

The second period of load shedding occurred in 1998 as a result of the low rainfall and inadequate resources to fund long-term investment because of low tariffs charged by the ECG and NEDCo (Malgas, 2008).

The third load shedding exercise took place between 2002 and 2003 and occurred as a result of low rainfall in the Volta Basin which caused low levels in the water level of the Akosombo Dam (Malgas, 2008).

The fourth major power crisis occurred between 2006 and 2007 because of reduced hydro generation, lack of investment and increase in electricity demand (Malgas, 2008). The fifth occurrence of load shedding started in 2012 and is currently on going although it seemed to have abated in its intensity and regularity.

Effects of load shedding on businesses

International literature on the effects of load shedding

A large amount of the research performed to determine the effects of electricity outages in the operations of businesses have shown that the electricity outages have a negative effect on cost of operations of businesses.

However, in a research to determine the impact of electricity outages on firms' productivity in Senegal in 2013, Lassana Cissokho and Abdoulaye Seck discovered that power outages made small and medium businesses cost and technically efficient (Cissokoho & Seck, 2013) . The researchers analysed 528 small and medium scale enterprises in Senegal experiencing load shedding, using cost technical and allocative efficiency scores (Cissokoho & Seck, 2013). According to the researchers, electricity outages ensured that businesses tried to find cost effective ways of operating and in doing so adopted best practices which improved their cost and technical efficiencies.

Researchers like C. W. Taylor have made clear the need for load shedding of electricity as an important way of ensuring stability of the electricity system and protect the system from an overall shut down (Taylor, 1992). Despite this fact most research

or studies undertaken have shown findings that imply that load shedding or power outages impact businesses in a negative way.

For example, in an article to assess the impact of the 1997 New York Blackout, the effects determined on businesses included; loss of production time, damage to plant equipment, destruction of product and additional maintenance cost (Corwin & Miles, 1997). Comparably, in the research to assess the impact of power rationing on the performance of selected Small and Medium Enterprises in Tanzania, the authors found that it had a negative impact.

Alban, Isaac, and Moshi (2014) found that, because of the frequent power outages, businesses go long hours without electricity. This affected the productivity of businesses and increased their cost of production because of additional funds spent on fuel to run generators.

The authors also stated that SMEs like Kiosks and supermarkets experienced serious problems from the rationing of power leading to low production, poor provision of services, failure to reach required sales volume and low income. This in turn led to reduced profits and impaired the financial and nonfinancial performance of these SMEs (Alban et al., 2014). The results of the research show that power rationing results in the stoppage of production equipment which affects productivity (Alban et al., 2014). Hence, SMEs like hairdressers, barbers photocopying and printing shops and grocers which highly depended on electricity for their daily operations were negatively affected. Therefore for these businesses, there was a significant relationship between power rationing and the decline in productivity. This means that the longer the duration of power rationing, the higher the decline in productivity (Alban et al., 2014). This implies that these SMEs lost customers at the time of load shedding hence reducing

their business income as some customers were not served. The study therefore concluded that power rationing had a negative impact on the performance of SMEs as these businesses lost productivity, sales volume, income and profits as a result of the load shedding exercises in Tanzania (Alban et al., 2014).

Ghana-specific literature on the effects of load shedding

Research on the effects of electricity load shedding in Ghana over the past years have shown that load shedding of electricity has had a negative impact on businesses. For example, the Centre for Policy Analyses identified that the 2007 load shedding exercise in Ghana led to an increase in the costs of local manufacturing firms and the government of Ghana lost approximately $3,636,360.00 in revenue as a result of decreased productivity in various sectors caused by the increased cost associated with the load shedding exercise (CEPA, 2011).

In an article to access the causes and effects of frequent and unannounced electricity blackouts on the operation of micro and small scale industries in Kumasi, Braimah and Amponsah (2012) found results similar to that of Alban et al. (2014). The research used both secondary and primary sources to assess the effects of the frequent and unannounced blackouts on the operations of SMEs (Braimah and Amponsah, 2012). Primary data was collected from a sample of 320 micro and small scale industries selected from three industrial clusters in Kumasi. Secondary data was obtained from five government institutions: the Ministry of Energy (MOE), Volta River Authority (VRA), and Electricity Company of Ghana (ECG), Energy Commission (EC), and Energy Foundation (EF) (Braimah and Amponsah, 2012). The data collected was grouped and analyzed using graphs and tables.

Braimah and Amponsah (2012) identified that businesses use electricity for their basic or primary activities and hence it is vital to their operations. The authors through interviews with Micro and Small Scale business owners in Kumasi discovered that blackouts caused destruction of equipment and hence businesses had to repair or replace them on a regular basis. For instance, 32% of cold store operators replaced their motors every year during the electricity crisis until they acquired stabilisers to control the intermittent supply of power (Braimah and Amponsah, 2012).

Braimah and Amponsah (2012) in Kumasi found that the load shedding of electricity destroyed the products of these companies. For example, cold stores lost products such as meat and fish until they were able to acquire alternative sources of power (Braimah and Amponsah, 2012).

Braimah and Amponsah (2012) also found that the frequent blackouts increased the production time of some businesses because they could not work during some hours of the day due to blackouts and hence some of these enterprises were unable to meet contract deadlines.

A discussion of relevant literature on coping strategies employed by SMEs against load shedding.

Due to the negative effects of load shedding on businesses most literature reviewed identified the increasing use of alternative sources of power such as backup generators to perform their operations during hours of power outages and load shedding.

Research has shown that most businesses use generators as an alternative source of power during periods of electricity load shedding. For example, in a research to determine the effects of electric power fluctuations on the profitability and

competitiveness of SMEs: A Study of SMEs within the Accra Business District of Ghana by Frederick Doe and Emmanuel Selasie Asamoah, it was found that most businesses use generators as an alternative source of power (Doe & Asamoah, 2014).

Doe and Asamoah (2014) conducted a cross-sectional survey of businesses located in the Accra business district. Data was collected from 70 small and medium scale businesses in Accra, selected using the systematic sampling approach (Doe & Asamoah, 2014). The data was collected using interviewed-administered structured questionnaire which focused on the effects of power fluctuations on the operations and profitability on SME's located in Accra. The data collected was grouped and analysed using the SPSS statistical package. Doe and Asamoah (2014) found that 66% of businesses use generators as a coping alternative during periods of load shedding (Doe & Asamoah, 2014). The article also mentions that in addition to this, some businesses use rechargeable lamps, kerosene lanterns and solar panels as alternative sources of power.

In a report by Scott, Darko, Lemma and Rud in 2014 to determine how electricity insecurity affects businesses in low and middle income countries, it was found that in addition to getting alternative sources of power, businesses may limit production or change their production process (Scott, Darko, Lemma, & Rud, 2014). The report states that, limiting production occurs during power outages when businesses cannot generate their own electricity to support production. On the other hand, some firms may change their production process by changing their operating hours.

Lessons learned, conclusions from literature review and contributions to the literature

In this section, various existing theories about the relationship between electricity supply or consumption and the growth of economies were discussed. Insight was also provided into the uses of electricity in businesses indirectly and directly for producing goods and services.

The review found that studies on the effects of load shedding on SMEs have provided two results. On one hand, research, such as that undertaken in Senegal by Cissokoho and Seck (2013) proved that electricity outages increase the cost and technical efficiencies of SMEs. This is because during periods of load shedding businesses try to reduce cost and therefore adopt best practices that make them more effective in terms of cost (Cissokoho & Seck, 2013).

On the other hand numerous researchers like Braimah and Amponsah (2012), have suggested that electricity outages negatively affect the cost and technical efficiencies of businesses. This is because of the steep cost associated with finding alternative power supply and decreased sales when cost of production increases.

Even though most research has proved the importance of electricity in businesses, not much research has been done into the effects of the load shedding on SMEs in terms of employment and employment arrangements exist. Further, studies which have been carried out into the effects of load shedding on businesses have concluded that SMEs need generators as an alternative source of power in order to perform their operations during hours of load shedding. However, some of these businesses may not be able to bear the additional cost of running generators and therefore operators find other coping strategies in order to salvage their businesses.

There has also been little research undertaken to determine the strategies these businesses use to protect their businesses from collapsing.

This study therefore helped to fill the gap in the existing research by studying and assessing the ways in which the current load shedding of electricity in Ghana is affecting SMEs in Madina and how they are surviving despite these effects. This was done by focusing on the effects load shedding these SMEs face and the coping strategies that they put in place in order to ensure that they stay in business.

CHAPTER 3. METHODOLOGY

Overview and Justification of the Research

The research investigated the impact of load shedding on businesses in the Madina district of Accra in Ghana and the coping strategies businesses employed in order to deal with these effects. For the purpose of this research, a mixed method approach was employed as both quantitative and qualitative data were collected and analyzed. Qualitative research was used in this research because it is difficult to quantify both the effects of load shedding on SMEs –which are typically located in the informal sector-, and- the coping strategies they use. These are key variables of this study. However, some aspects such as the impact on employment numbers required the use of quantitative data which was also collected from respondents and analyzed.

The methodology chapter is made up of different sub-sections namely: the discussion of key variables, research design, research scope, sampling strategy, data collection, data analysis, ethical consideration, validity and reliability and limitations

Discussion of key variables

The key variables of this research are (i) load shedding of electricity and (ii) coping strategies. These variables are termed key because the purpose of this research is to learn about the coping strategies SMEs in Madina use during load shedding to survive the effects.

Load shedding of electricity for the purpose of this research refers to unavailability of electricity from the national grid: the usual source of electricity supply and how it affects the operation of SMEs.

The coping strategies are all the measures these Small and Medium Scale companies put in place to help them survive the load shedding exercise and prevent them from collapsing during periods of load shedding.

Research design

Research design refers to the strategy used to integrate the different components of a study in a coherent and logical way, thereby ensuring that the research problem is addressed effectively (Trochim, 2006). The research design of a study consists of a blueprint for the collection, measurement, and analysis of data to be used in that study (Philips, 1976). The purpose of a research design may be to explore, describe, explain, predict, evaluate or tell the history of a phenomenon.

The type of research design used in a study is usually determined by the research problem. There are three major types of research design; exploratory, descriptive and explanatory research. A detailed description of the different types of research design is included in the appendix.

This research employed the exploratory research design to achieve its objective. Exploratory research is used where there are high levels of uncertainty or ignorance about the subject of the study. This research design is usually very flexible and unstructured. The aim of exploratory research is to identify the boundaries of the environment in which the problems are likely reside, opportunities or situations of interest, and to identify the salient factors or variables that might be found there and be of relevance to the research (Wyk, 2012).

This thesis focused on determining the effects of load shedding on SMEs in Madina and the coping strategies they put in place to survive the effects of the electricity load shedding. Due to the nature of the topic and the research objectives, the study took

an explorative nature. This aided in the determination of the key operational variables in the research and reduced the pressure of having to make causal conclusion from unstructured mostly qualitative data.

According to Zikmund 2003, explorative research is the first step in a series of studies designed to supply information for decision making or answering a question (Zikmund, 2003). Hence this research provides information about coping strategies, based on which subsequent research can be done to obtain additional information on the subject. The variables in this research were analyzed to find the relationship between the independent variable and the dependent variable.

Research Scope

Study Population

The study population of this research was SME businesses located in Madina because they could provide the information needed for this study. The specific target population was owners or operators of Small and Medium Scale Enterprises in Madina. As a result of the limitations in the record keeping systems in Ghana, the researcher could not obtain the actual number of SMEs located at Madina. However, for the purpose of this study, it was estimated that, the total number of SMEs located at Madina are 150 and out of these, the operations of 75 of them depended on the use of electricity.

Study Area

The study area of the dissertation wass Ghana specifically Madina. This area is located within the Madina Metropolitan Assembly of the Greater Accra Region of Ghana. The area is filled with a wide range large to small and medium scale (SME) businesses, banks, department stores, vendors.

Source of data

Journal articles were reviewed in the order to obtain an in-depth understanding of load shedding, its causes and effects on businesses. Semi-structured questionnaires (administered by the researcher to circumvent issues of possible language barriers and to clarify questions) were used to gather data for the study. Semi-structured questionnaires were used because they enabled the researcher to obtain as much information as possible from the sample. This mode of data collection was chosen because, it made it easier and quicker for respondents to answer and for the researcher to compare and analyse the answers. It also decreased the number of irrelevant answers that would have been provided by the respondents.

Sampling strategy

Sampling technique

The sampling method used in the study was non-probabilistic sampling. Non-probabilistic sampling refers to the sampling technique which does not involve random selection of or respondents (Trochim, 2006). Non-probability sampling ensures that the sample of the study is selected based on the subjective judgments of the researcher and not by random selection (Laerd Dissertation, 2016). There are five basic types of non-probabilistic sampling. These are: quota sampling**,** convenience sampling**,** purposive sampling**,** self-selection sampling and snowball sampling (Laerd Dissertation, 2016).[i] A detailed descriptions of the different types of non-probabilistic sampling is provided in the appendix.

Non-probabilistic purposive sampling was used in this research because the research objectives required that the researcher speaks to people who run businesses which depended solely or partly on electricity. This is because they know, understand and can explain the coping strategies, and the reason for choosing those particular

strategies. This method was the best because it ensured that responses received were relevant to the research and not just peoples subjective opinions.

Sample size

The sample size of 45 small and medium scale businesses was determined for this research using a sample size calculator. However, due to some limitations, responses were obtained from just 31 SMEs. One of these constraints was availability of respondents: some SMEs visited said that they could not help because they were working. Other small and medium scale business located in Madina could not be used because their operations did not depend on electricity and hence the load shedding did not affect their operations. Some of these were retailers and wholesalers of convenience items. Another constraint was limited time for collecting data and the high cost of travelling to Madina from Berekuso. As a result of these constraints, the researcher obtained an acceptable response rate of 69%.

Data collection

Data Collection Instruments

A semi-structured questionnaire guide was used to obtain data from the sample about the effects of load shedding on their businesses, their coping strategies and the employment arrangements made during periods of load shedding. The questionnaire was administered by the researcher to circumvent issues of possible language barriers and to clarify questions.

Data Collection Procedure

The researcher used the following steps in collecting the data:

- Decided the type of data required from respondents and the appropriate data collection tool.

- Determining the sampling method, size and analysis method:
  - Sampling Methods: Purposive Sampling.
  - Sample size: 45 SME business operators in Madina but 31 responded.
  - Analysis Method: Graphical and Content analysis
  - Computer Statistical Software: Microsoft EXCEL.
- Prepared questionnaire.
- Administered questionnaires.
- Data Analysis.

Data Collation

On 9th March 2016, the researcher set off alone to Madina at around 10am. To get to Madina, the researcher chartered a taxi from Berekuso. For the collection of data, no translator was needed because the respondents in the research were people who understand English and know how to read and write. Because the researcher had not secured promises from business owners to fill the questionnaire, it was difficult for the researcher to get the expected number of respondents. A questionnaire was used in obtaining information from the respondents.

Prior to this, a pilot study was undertaken by the researcher to test the clarity of the questions. Because of the clarity, the respondents understood questions and therefore no further questions arose during the data collection. The researcher was however present to supervise in case there was a need for further clarifications.

The information received from respondents was then sorted out and analysed in order to obtain results. Information collected was handled only by the researcher to protect the confidentiality of respondents.

Data Analysis

The responses collected were grouped under themes and content analysis was used to analyse responses. This was done to obtain an in-depth analysis of the data collected from respondents. Microsoft Excel was used to draw graphs based on data received from the respondents.

Ethical Considerations

The researcher obtained approval for her research proposal from her institutions' "Human Subjects Review Committee" to ensure that her methodology for collecting data was in conformity with international ethical standards. All information obtained from respondents was treated with confidentiality, including the details of the respondents. In addition to this, the respondents were informed that they could opt out in case they felt uncomfortable. Also, the researcher was objective in the analysis of data obtained.

Validity

Validity is defined as the extent to which a research measures what it intends to measure (Smith, 1991). It deals with the ability of the research to provide results that are suitable to be generalised to the entire population. There are three types of validity; internal validity, External validity and Construct validity. A more extensive discussion of the different types of validity and their application can be found in the appendix

To ensure validity, the researcher ensured that no personal biases influenced the findings of the research and this was done by ensuring that the data interpretation were consistent with the responses received from respondents and also responses received were not altered based on the researcher's opinion or judgement. Also, to ensure that results obtained from the sample size can be generalised, all the SMEs located in

Madina whose operations depend on electricity were represented in the sample for the study. In addition to this, the data collected was analysed using the most appropriate method and all responses received were included in the findings.

Limitations

- Time was one of the limitations of this research. This is because the researcher was given limited time to collect data and hence the target number to respondents could not be achieved
- The unwillingness of some businesses to take part. Another limitation of the study was that some of the small and businesses were not willing to take part in the survey because they did not feel like it.
- Another limitation of the study was cost. The cost of travelling to the study area was high and therefore affected the number of times time researcher visited the area.

CHAPTER 4: DATA ANALYSIS

The researcher collected data from thirty-one (31) respondents through the use of semi-structured questionnaires. These respondents were small and Medium Scale businesses based in Madina. These businesses included cold stores, hairdressing salons, barbering shops, electrical appliance shops, phone repair and retail shops, internet cafes, forex bureaus, bakeries and laundry service.

The questions posed centred on the effects of load shedding on their businesses, the measures they put in place to curb those effects and the reasons they chose those strategies. The questions also included whether or not the load shedding had an impact on employment and employment arrangements in their businesses. All graphs and charts used in this study are included in the appendix.

From the research, 31 out of 31 of the respondents stated that the load shedding of electricity was affecting their operations in either a positive or a negative way. A graphical representation of this can be seen from Figure 1 in the appendix which is a pie chart showing percentage of respondents who reported that the load shedding exercise was having an effect on their business.

From Figure 1, it can be seen that 100% of the respondents were being affected by the load shedding of electricity in the country. All respondents in the research report that the load shedding of electricity had some negative effects on their businesses. However, 4 of these respondents reported that in addition to the negative effects, the load shedding of electricity also had some positive effects on their businesses. These will be discussed later in the chapter.

Some of the negative effects of load shedding experienced by respondents were increase in operating cost, loss of production time, loss of revenue, decrease in

productivity, damage to plant equipment, increased expenditure, reduction in labour force and overnight work. Some respondents also experienced positive effects such as an increase in sales and revenue.

One of the factors that were impacted by the load shedding was employment. Most of the respondents reported that employment in their businesses had either remained constant or decreased as a result of the effects of the load shedding. This can be seen in Figure 2 in the appendix. The chart represents the percentage of businesses in which employment increased, decreased or remained the same. From the chart, it can be seen that 45% businesses representing fourteen (14) of the respondents reported that employment in their business has decreased since the beginning of the load shedding exercise. For these businesses, employment decreased because productivity was low and cost of operation was high. Therefore, they could not afford to pay all employees and had to lay some off as a means to decreasing cost.

Two respondents (7%), of the total respondents said that employment in their businesses increased. These 2 respondents respectively operated a hairdressing salon and an electrical shop. The owner of the electrical shop stated the reason for this was the increase in sales of stock like solar power lamps, sockets, bulbs among others. As a result of this increase they started stocking more products and he had to hire two more people to help with this. The owner of the hairdressing salon said employment increased in her business because she had to hire a technician to operate the generator. 15 respondents representing 48% of the total respondents said that employment in their businesses did not change but remained constant.

The reported coping strategies used in businesses to survive the effects of the load sheding exercise included: the use of electric generators, reduction in labor force,

early closure, solar power, uninterrupted power supply, power banks, inventors and others.

An electric generator is a device that converts mechanical energy to electrical energy which has the ability of powering all types of devices in an external circuit (revolvy.com, 2016). A generator can provide power for a large range of equipment ranging from fans, computers, machines to entire buildings.

An uninterrupted power supply device (UPS) is an emergency source of power that allows an electrical device to keep running for a short while after its primary source of power is cut off (Rouse, 2015).

A Power bank is a portable source of electricity that supplies USB power using stored electricity in its built-in batteries. Power banks are mostly used for mobile tablet devices or phones. An inverter, on the other hand is an electronic device that and converts direct current to from a battery to alternative current for electrical devices when needed for use (David, 2016). An inverter unlike the power bank can be used for all kinds of electrical appliances like lights, kitchen appliances, power tools, TVs, radios, and computers.

The research showed that 84% of the respondents used electric generators as an alternative source of power either as their sole coping strategy or as part of a combination of coping measures. This is in line with the results of Doe and Asamoah (2014), who stated that in the Accra business district the most popular source of alternative power was the generator (Doe & Asamoah, 2014).

The coping strategies used by businesses and the percentage of businesses that use each of them can be seen in Figure 3. From the graph it can be seen that 84%, representing twenty-six respondents used electric generators. Twelve of the

respondents representing 39% used early closure. This means that during periods of load shedding, they closed their businesses before the usual closing times. It can also be seen that 19%, representing six respondents reduced their labor force and the same number and percentage of the respondents used Uninterrupted power supply devices. Five of the respondents representing 16% reported that they used power banks. This number and percentage was the same for respondents who used solar power. The graph shows that inverters had the lowest usage of only two of the respondents which represents 6% of the total respondents. Three of the respondents representing 10% stated that they used other coping strategies.

The other coping strategies included the use of voltage stabilizers by shops and cold stores and the cutting of some jobs such as washing and straightening from the portfolios of hairdressers.

The research showed that to survive the effects of the load shedding some of the respondents used a combination of these coping strategies and others used only one of them. A graphical representation of this can be seen in Figure 4 in the appendix. From the figure, it can be seen that 20 out of the 31 businesses who represented 65% of the total respondents used a combination of two or more of the strategies mentioned above. Some of these combinations were; “generator and UPS”, “generator and voltage stabilizer”, “generator and early closure”, “generator and solar power”, “generator and reduction in labour force”, “early closure and the cutting of some jobs from the business’s portfolio”, “generator, early closure, power banks, reduction in labour force, solar power and UPS”, “generator, early closure, UPS and reducing labour force”, and “the use of early closure, inventors and voltage stabilizers”.

The reason reported for the combination of these coping strategies was to help reduce the usage of each of them thereby reducing the cost of each strategy. The operator of a bakery reported that they combine the use of an electric generator with early closure, solar power and power banks so as to manage cost. For instance, because of the combination, they do not buy fuel as much as they would have since sometimes they close early and other times they use solar power.

9 out of 31 respondents representing 29% of the total respondent used generators as their sole coping mechanism during periods of load shedding. Two of the respondents who represented 6% used only early closure.

The responses gathered as to why respondents use these coping strategies are quite similar. One reason respondents used generators was because, it was the best alternative power source were better for running the kind machines used in their businesses. Respondents who mentioned this included cold stores, a laundry, an internet café, a microfinance shop and a school. For example, according to the manager of a school, an electric generator was selected as an alternative source of power because they operate a lot of computers, lights and other electrical appliances; therefore the generator is a better fit because it can support all their electrical appliances at the same time.

Other respondents chose to use generators because it was more reliable and convenient for them and helped move the business and retain customers. For example, according to a cold store owner, she prefers to use generator because it is strong enough and more convenient at providing the needed electricity for her freezer. According to her, she does not have to worry about it being unstable because she always buys enough fuel and services it properly.

Another reason some respondents chose to use generators as the only coping measure or one of the coping measures is because it increased their productivity and helped in the operation of their basic business activity. According to the owner of an electrical shop, without the generator, they would not be able to test bulbs and other electrical appliances for customers, which will decrease their sales because most customers will not buy their products unless they are tested at the moment of purchase. Hence, the use of generator helped them test bulbs for customer and helped retain most of their customers. From the survey, it was realized that factors such as noise and smoke from the use of generators did not affects their decision to use it.

According to the respondents that chose early closure as a measure to protect their businesses during the load shedding did that because, they did not have enough money to afford other alternative sources of power or measures. For example, according to a barbering shop owner, he closes early or does not work on days he does not have electricity, because he cannot afford any other coping strategy like a generator and the cost of fuel without making a loss and shutting down.

Another measure used by respondents were uninterrupted power suppliers for protection from interrupted power supply. The six respondents who used this stated that the uninterrupted power supply devices helps provide emergency power case the electricity was cut off. Therefore in the case where the electricity goes off, they will have a some minutes of reserve power on the UPS which can be used to save documents or keep electrical devices on while the generator or inventor is being turned on. For example, the operator of an internet café stated that the UPS ensures that no work is lost by customers when the electricity is turned off because it provides enough time for them to save their work or logout.

The two respondents who used inverters as a coping strategy were a retail shop and a salon. According to these two respondents, they charge the invertors when the electricity is on and during periods of load shedding, they connect fridges, hair driers and other electrical devices to it in order to continue operating.

The five respondents who stated that they used solar power were electrical appliance shops which sold solar power as part of their products. According to these respondents they used solar power that is, solar powered lumps and lights because they bought these items in bulk at the wholesale price to sell and sometimes even got extra free ones from their bulk purchase.

Five out of thirty one of the respondents (8%) also said that they use power banks to charge their gadgets such as phones. For example, the operator of a bakery said that they used power banks to charge the business's mobile phones in order to make sure the phone were always on which allowed customers to reach them at any time to make orders.

The respondents in addition to these measures mentioned other measures they put in place in order to minimize the effects of load shedding on their businesses. One of these measures was the use of voltage stabilizers. Voltage stabilizers were used by some respondents as a way of protecting their equipment from being destroyed as a result of unstable electricity. The use of this device reduced damage to equipment caused by the frequent power outages and unstable electric current. For example, the operator of a cold store stated that, he uses voltage stabilizers along with his generator to protect his freezer from getting damaged during periods of load shedding.

From the analysis of the data collected, the researcher found that the number of times businesses buy fuel differ. The different number of times fuel is purchased by

respondents can be seen in Figure 5. From the figure, it can be seen that none of the respondents bought fuel to power the generator more than twice a day. Two respondents representing 7% stated that they buy fuel twice a day.

Thirty-two percent (32%) of the respondents which represents 10 individual respondents reported that they buy fuel every day to power their generator. Four respondents, representing 13% of the total respondents said that they bought fuel 5 to 6 times a week.

6 businesses representing 19% of respondents reported that they buy fuel 3 to 4 times a week. 4 respondents which represents 13% said they but fuel 1 to 2 times a week. The remaining 5 respondents who represent 16% of the total respondents reported that they do not buy fuel at all because they do not use generators.

Respondents were also asked to compare the cost of buying fuel to the cost of electricity provided by the Electricity Company of Ghana (ECG). A graphical representation of this can be seen on Figure 6. From the chart, it can be seen that 8 respondents, representing 26% reported that compared to the cost of electricity from ECG, the cost of fuel is very expensive. 13 of the respondents, representing 42% reported that for them the price of fuel is expensive when compared to what is charged by ECG.

Most of the respondents who said it was very expensive or expensive reported that this was because, they had to pay a full electricity bill at the end of the month at the same time as spending money on fuel for generators. 4 respondents representing 13% said that to them the price of fuel was moderate compared to the price of ECG. None of the respondents reported that the price of fuel compared to ECG is cheap. However, 6 of the respondents which included the 5 who do not use generators and one

printing and advertising company reported that they could not compare the price of fuel to ECG.

The respondents were also asked to rate the cost of solar power as compared to the cost of electricity provided by ECG. The ratings by all the 31 respondents can be seen on the pie chart in figure 7. The chart shows that none of the respondents thought solar power was very expensive or expensive. 4 businesses, representing 13% of the all respondents however reported that the price of solar power was moderate as compared to that of ECG. One of the respondents said that as compared to the prices of ECG, solar power is cheap because he sells it and hence gets some for free from bulk distributors, hence he does not have to spend money on it. However, 27 of the respondents representing 87% said that they could not make a comparison between the two because did not use solar power as a coping strategy.

Figure 8 however illustrates the ratings of only the five respondents who use solar power. Out of these five respondents who use solar power as part of their coping measures, none of them reported that solar power was very expensive or expensive. Four of the five respondents however reported that cost of solar power compared to the cost of electricity provided by ECG was moderate. These four represent 80% of only the respondents who actually use solar power. One of the respondents stated that it was cheap for his business, this represented the rest of the 20% of respondents who use solar power as part of their coping measures.

The respondents were also asked to compare the cost of their overall coping strategy to cost of electricity provided by ECG. This comparison can be seen in Figure 9 in the appendix. From the figure, it can be seen that 26% of the respondents representing 8 business operators, reported that their overall coping strategy was very

expensive as compared to prices charged by ECG. On the other hand 16 respondents, representing 52% stated that the cost their coping strategies were expensive as compared to the prices charged by ECG. Four respondents, representing 13%, stated that the price of their coping strategy were moderate when compared to the price charged by ECG. However, none of the respondents indicated that their overall coping strategy was cheap when compared to that of ECG. 3 of the respondents representing 10% however stated that they could not compare the cost of their coping strategy to ECG's prices.

From the use of these coping strategies, most businesses experienced positive effects as well as negative effects. Some of these positive effects were decrease in production time; increase in revenue; increase in productivity; reduced damage to equipment; retained labour force; improved quality goods and services among others.

The production time decreased for 9 of the respondents which represents 29%. This means that the time used in producing goods and services for customers as well as the time used in satisfying the customer needs decreased when they used their coping strategies during periods ECG had turned the electricity off. For example, according to the operator of a printing and advertisement company, less time was used in printing customers order's during times the lights were off because they used a generator and uninterrupted power supply.

Thirteen of the respondents reported that the use of the coping measures increased the revenue they made during the periods in which the electricity was turned off by ECG. This represents 42% of the total respondents. This is because the use of their coping strategies helped them perform some functions during light off periods, which they could not have been able to perform without using these measures. For

example, the owner of a hairdressing salon reported that because the business used generator during the times which the electricity were turned off by ECG, they made money from several operations which they could not have been able to perform without electricity from the generators. These operations included washing, drying and tonging hair for customers. Therefore customers visited other salons to get these services or performed them at home ally did this at home.

Ten respondents representing 32% stated that the use of coping measures during periods load shedding increased their productivity during these periods. This is because, without these coping strategies, workers would have remained redundant during periods of load shedding. Therefore adopting these measures prevented workers from being redundant and increased productivity.

Another ten respondents, representing 32% stated that the use of these coping measures load shedding reduced damage to their equipment. For example, a cold store operator reported that using a voltage stabilizer and a generator helps protect the freezer from being destroyed as a result of the frequent disruptions in the supply of electricity.

Another ten respondents reported that the use of their coping measures helped retain or increase their labour force. Two of these 10 respondents reported an increase in employment as a result of the coping strategies used. The first of these two businesses was a hairdressing salon which reported that, a new technician was employed to operate the generator during periods of load shedding. The second which was an electrical shop reported that because of the load shedding there was an increase in sales of solar powered lumps and bulbs, hence they had to start stocking more of these items, and as a result, they hired two more people to help in doing this. The remaining eight if the respondents reported that the number of people employed were retained because the

use of these coping measures helped them make money during periods of load shedding and hence they could afford to pay workers.

The provision of quality goods and services to customers was also one of the positive effects of adopting these coping strategies. Eight of the respondents stated that the adoption of these coping strategies helped ensure that only quality services and goods are provided to customers, which may not be the case without these coping strategies. These 8 represented 26% of the total number of respondents. For example, the operator of an electrical shop stated that the use of generator ensured that only quality goods such as bulbs, tubes and other electrical gadgets were sold to customers. This is because, by using the generator, bulbs and other appliances being bought by consumers were tested before being sold to individuals hence those that were not good or that were spoilt were not sold to customers.

Three of the respondents, representing 10% of the total respondents said they experienced other positive effects. One of these included the time and ability to pursue other business ventures by a barber who adopted early closure as a coping strategy. Another was that the adoption of alternative sources of power by a cold store reduced the amount of meat and fish (stock) that got spoiled during the period as a result of the load shedding. The owner of hairdressing salon also reported that the use of alternative sources of power helped her retain most of her customers since she could always provide the services they wanted because of the electricity provided by these alternative sources.

One of the respondents, an operator of a beauty salon, reported that they did not get any positive benefit from the use of their coping strategy which was early closure during the periods that they did not have electricity. They chose this strategy because

they could not make enough money to afford any other measure which would help in their operation. Figure 10 illustrates the above positive effects of coping strategies and the percentage of businesses experiencing them on a bar graph.

The negative effects of adopting these coping strategies included an increase in cost of production, the reduction in labour force as a result of the increase in the cost of operation and others.

Figure 11 in the appendix shows these negative effects of adopting these coping strategies and the percentage of respondents that experience these effects. From the pie chart, it can be seen that 29 of the respondents representing 94% reported that the use of these coping strategies increased their cost of operation. This is because they incurred more cost in purchasing or adopting these coping strategies. 14 out of these 29 respondents reported that as a result of this increase in cost, they had to lay off some workers.

Two respondents which represents 6%, reported that they experienced other negative effects. The two are the owners of barbering shop who adopted early closure and did not open on some days when the electricity was turned off by ECG. According to them, not coming to work sometimes and closing early made them lose some of their regular customers to other barbering shops around.

Out of these 29 businesses which represent 94% of the respondents whose costs increased as a result of adopting these coping strategies, some of them had to decrease the number of people they employed in order to minimize the effects. Figure 12 illustrates the percentage of respondents that had to reduce employment as a result of this increase in operating cost. From the chart, it can be seen that 14 businesses, which represent 48% of the respondents who faced increase in the cost of operation from

adopting various coping strategies, also reported a reduction in their labour force as a result of the increase in cost. While for 52% of the respondents, the labour force in their businesses stayed constant.

The research also showed that the load shedding of electricity had some positive effects on some businesses in addition to the negative effects. Four of the businesses, representing 13% of respondents stated that the load shedding of electricity had some positive effects on them. For example, the owner of a barbering shop and the operator of a car paint selling business stated that for them, during periods of load shedding, they got more time to rest since they were not working during those hours. Two electrical shops also reported that the increase in the sales of lump, bulbs and other electrical gadgets and solar gadgets. 27 of the businesses, which represent 87% of respondents, reported that the load shedding of electricity had no positive effect on their businesses. Figure 13 in the appendix shows a representation of this on a bar graph.

The study also showed that some of the respondents plan to adopt other coping measures in the future. As seen from figure 14 in the appendix, thirteen of the respondents, which represents 42% stated that they planned on getting alternative sources of power in the future to help support the operations of their businesses during periods of load shedding. 14 of the respondents which represents 45% said they had no future plans at the moment. And 4 respondents who represent 13% said they had other plans. The owner of a bakery and the operator of a car paint selling business stated that they planned to change their business if things got really bad to other businesses which do not heavily depend on electricity. The operator of a Super Bet shop stated that his plan for the future was to wait on the government to bring in power badges which will increase the supply of electricity. The operator of an electrical shop stated that his plan for the future was to let workers come early and run shifts till late in the night. This is

because, their sales and revenue increase during periods of load shedding and hence to ensure that customers can always access the shop for products they needed, they had to keep the shop open for a longer period of time.

Out of the 42% of respondents (13 businesses) that planned to get alternative sources of power, 6 of them representing 46% of respondents planned to put up solar panels, 4 (31%) of them stated that they will buy generator plants. One of the respondents stated he planned to get both a generator plant for operating computers and a solar plant for lights, fans and air conditioners. Another respondent, a shop operator stated that she planned to buy rechargeable fans and lights in order to use when ECG turns off the power, this will enable her stay in the shop longer when the lights are off because it will reduce heat. The owner of a beauty salon also stated that she planned on buying an inventor in the future, so that when the electricity is off, she can still connect equipment's like the dryer, tong and straightener to it in order to serve customers. A graphical representation of this can be seen on Figure 15 in the appendix.

The research also showed that the load shedding of electricity affected the employment arrangements of some small and medium scale companies located at Madina. Nine businesses representing twenty-nine per cent (29%) of the respondents stated that the load shedding of electricity is affecting employment arrangements in their businesses. The operators of a barbering shop and a beauty salon stated that they work only on days customers to call to book appointments. Therefore, on the days they do not have appointments they do not open their shops.

The owners of a barbering shop and a bakery reported that on some days when the ECG turns off the electricity supply, they do not work at all. This allows them to

save money and not bear a lot of extra cost associated with adopting other coping strategies.

In addition to this, some of the respondents stated that they run shifts for workers, in order to ensure that some workers do not come to work and stay redundant for the day. For example, the operator of a cold store stated that he runs daily shifts for the workers, where each day there is only one worker in the store. This helped decrease the number of hours each worked by each person and hence decreased the amount of money he had to pay each of them. Other respondents who run shifts included a barbering shop and an electrical shop.

The operator of a Super Bet shop stated that before the beginning of the load shedding, he used to employ a number of people every month. However, after the beginning of the load shedding exercise, he could not bear the cost of hiring more people.

One of the respondents reported that the load shedding of electricity has increased the efficiency of his or her workers. This is because according to him, workers do not want to lose their jobs and therefore report to work on time and work very hard to increase their individual productivity and their value to the business. This finding is similar to that of Lassana Cissokho and Abdoulaye Seck in Senegal (2013). In a research to determine the impact of electricity outages on firms' productivity in Senegal, the researchers discovered that power outages made small and medium businesses cost and technically efficient in their operations.

On the other hand, 23 of the respondents, representing 74% of respondents said that the load shedding of electricity did not affect the employment arrangements within

their company. Figure 16 shows the percentage of respondents whose employment arrangements were affected by the load shedding exercise.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

Conclusion

It was noted from the research that the recent load shedding of electricity in Ghana affected the operation all the respondents. The main negative effects reported by the 31 respondents included increase in operating cost, loss of production time, loss of revenue, decrease in productivity, damage to plant equipment, increased expenditure and a reduction in labour force. A few respondents, mostly electrical shop operators who sold solar and electrical appliances reported positive effects such as an increase in sales and revenue.

The coping strategies used by these businesses included; electric generators, reduction in labor force, early closure, solar power, uninterrupted power supply, power banks, inventors and voltage stabilizers. It was noted that most respondents chose to use a combination of two or more coping strategies however a few used generator only and early closure only, figure 4 shows this.

From Figure 3, it can be seen that the most used coping strategy was electric generators and this was followed by early closure. The reasons why electric generators were the most used measure included the fact that that it was better for the kinds of equipment respondents used, they were reliable, convenient and increased productivity. Some of the respondents also reported that they used a generator because their business already had one. Early closure was mostly used by respondents who stated that they could not afford any ther coping strategy.

The third most common strategies were reduction in labour force and the use of uninterrupted power supply devices which both had the same percentage of usage. The use of power banks and solar power were next and both had the same percentage of

usage. The coping strategy with the least usage among respondents turned out to be inverters.

The respondents reported that the use of these coping strategies had positive effects as well as negative effects as seen in figures 10 and 11. One positive effect of adopting these measures stated by respondents was the decreased in the time used in production or performing a task from what it would have been if there was no alternative source of electricity. Other positive effects included an increase in revenue, productivity and the provision quality products and services made during times when electricity is cut off by ECG. The adoption of coping measures also helped to reduce damage to equipment and helped increase (or retain) their labour force.

Respondents reported the main negative effects of adopting the coping strategies to be an increase in the cost of operation. However a few respondents reported that the adoption of early closure made them lose some customers. As seen in table 12, the increase the cost of production led to a reduction in the labour force in the businesses of close to half of the respondents. This is because they could not afford to pay some of their workers because of the additional cost incurred from adopting the coping measures.

Even though most employment arrangements remained the same however, a few changed as some businesses begun to run shifts and change operation hours according to ECG's load shedding schedule.

About half of the respondents reported that in case the load shedding of electricity is continued in the future, they planned to get alternative sources of power such as generator plants, solar panels, rechargeable lights and funs and Inverters. Others reported that they planned to change their businesses to others that do not heavily

depend on electricity while close to half of the respondents said they had no future plans in case the load shedding of electricity is persists.

Recommendation

Having established that electricity is a significant factor for the operation and growth of small and medium scale enterprises and the role of SMEs in the growth and development of the economy, it must be ensured that electricity generating equipment like turbines, power plants and dams are kept in their perfect state to ensure that they perform to their highest capacity. The government and organisations in charge of providing electricity should also ensure that sufficient research and resources are channelled to ensuring a constant supply of stable electricity within the country.

However, in case the systems fails to ensure that there is a constant supply of electricity and the load shedding of electricity is adopted to prevent a complete failure of the electricity system, SMEs are likely to face the negative effects of load shedding reported in this research. In order to survive these effects and to ensure the continuous operation of their businesses, they may adopt any one or a combination of the coping strategies respondents in this research adopted or planned to adopt in the future based on their preferences and knowledge of what is best for their businesses.

In addition to this, in case the load shedding of electricity becomes inevitable as a result of low production and supply of electricity, the government and the Electricity Company of Ghana (ECG) should release an effective load shedding schedule to businesses ahead of time. This will enable businesses (SMEs) plan ahead of time and put in place measures which will minimize the costs they incur and maximize their efficiencies during periods of load shedding.

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APPENDIX

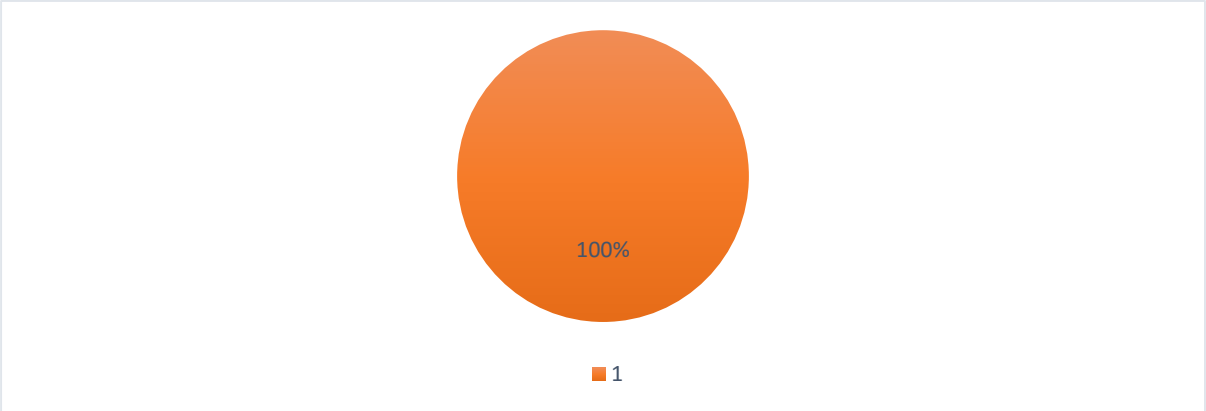

Figure 1 Pie Chart indicating the respondents being affected by the load shedding of electricity.

Data source: Field Data

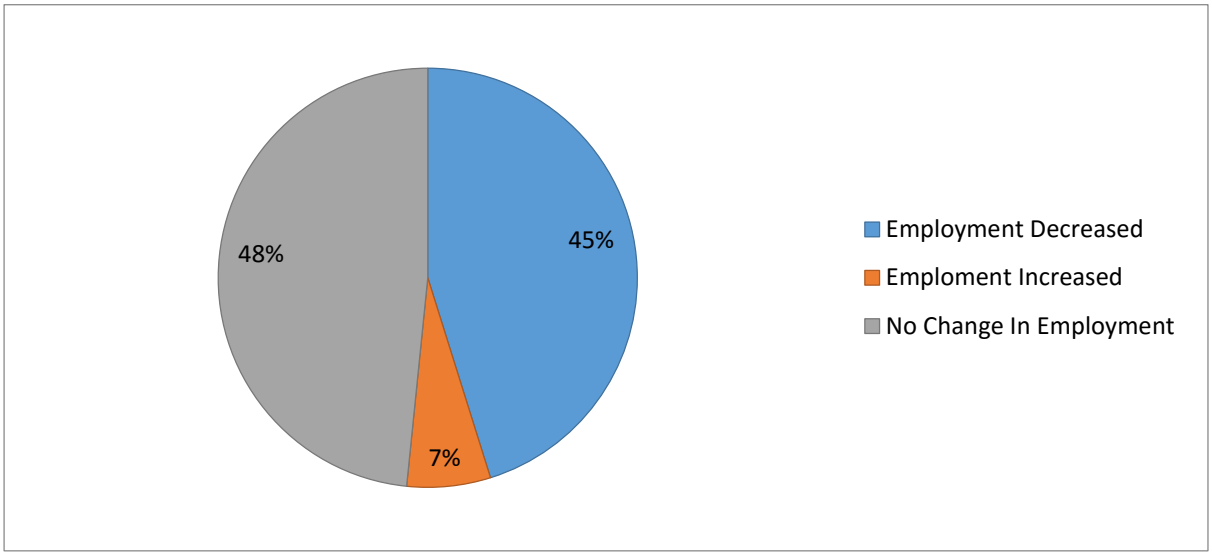

Figure 2 PIE Chart Showing the Effects of Load shedding on Employment in SMES Located at Madina.

Data source: Field Data

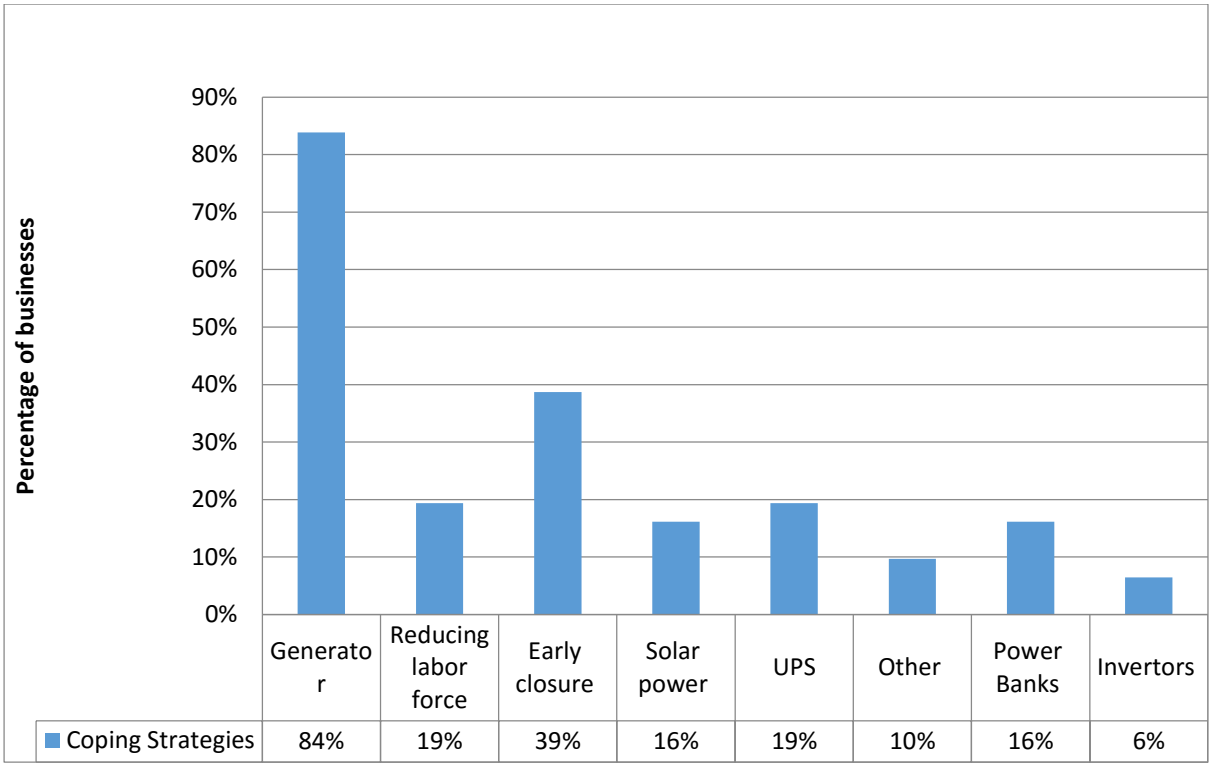

Figure 3 Bar Chart indicating the coping strategies adopted by respondents

Data source: Field Data

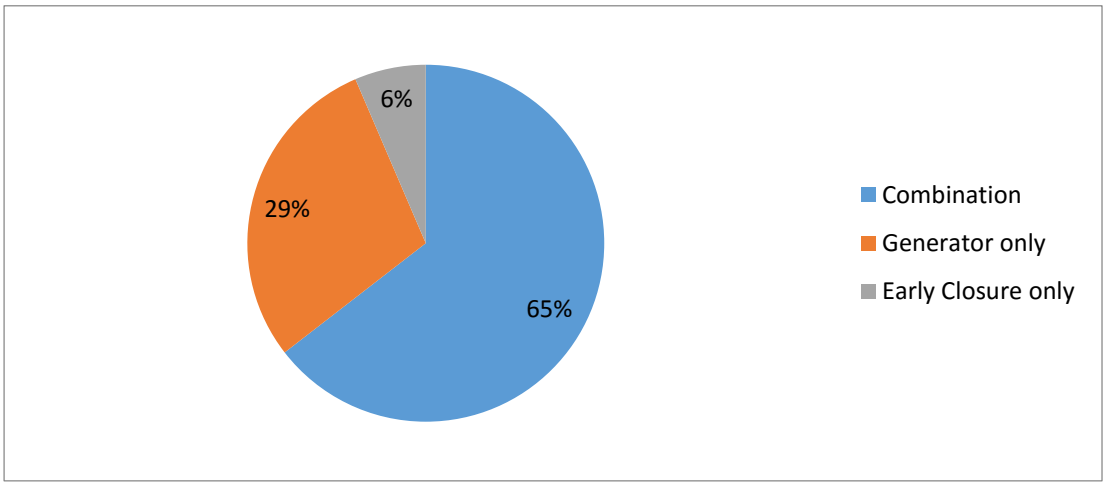

Figure 4 Pie Chart Indicating The Percentage Of Respondents Who Use A Combination Of Coping Strategies And The Percentage Of Respondents Who Use One Coping Strategy.

Data source: Field Data

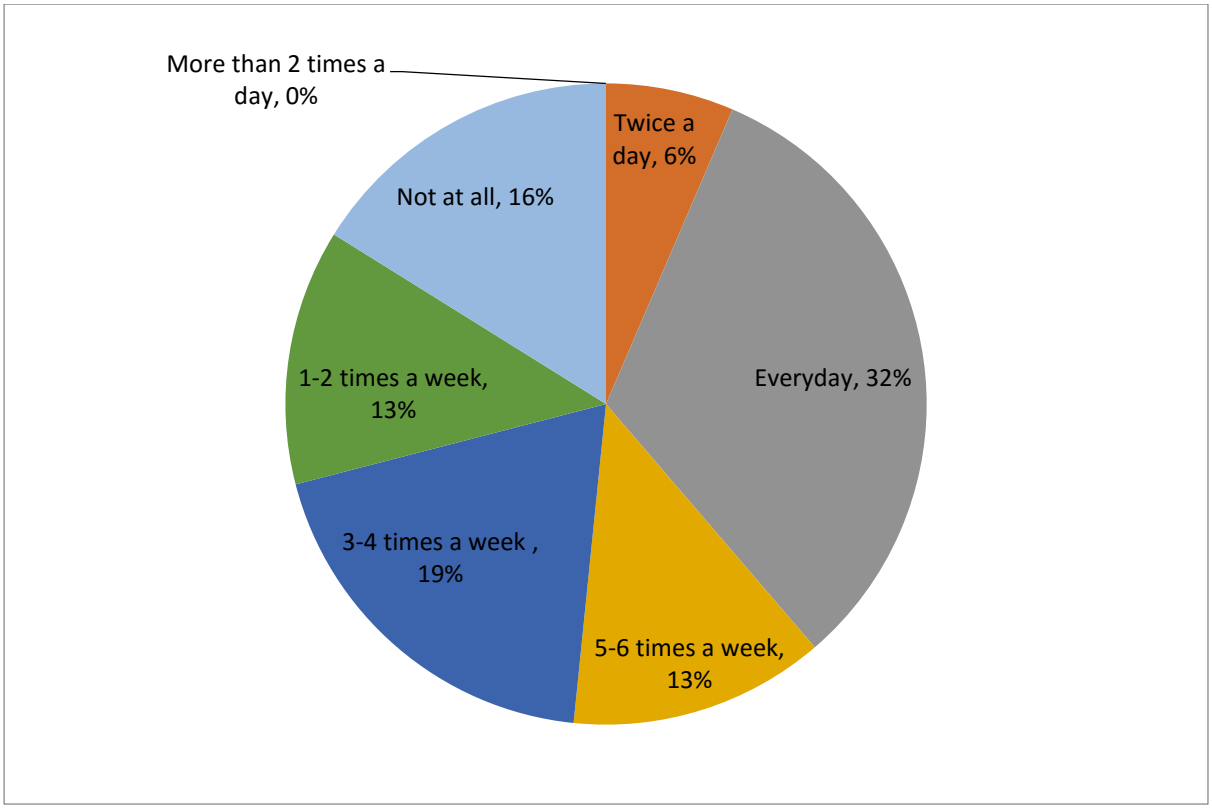

Figure 5 Pie Chart Indicating How Often Respondents Buy fuel to Operate Generators

Data Source: Field Data

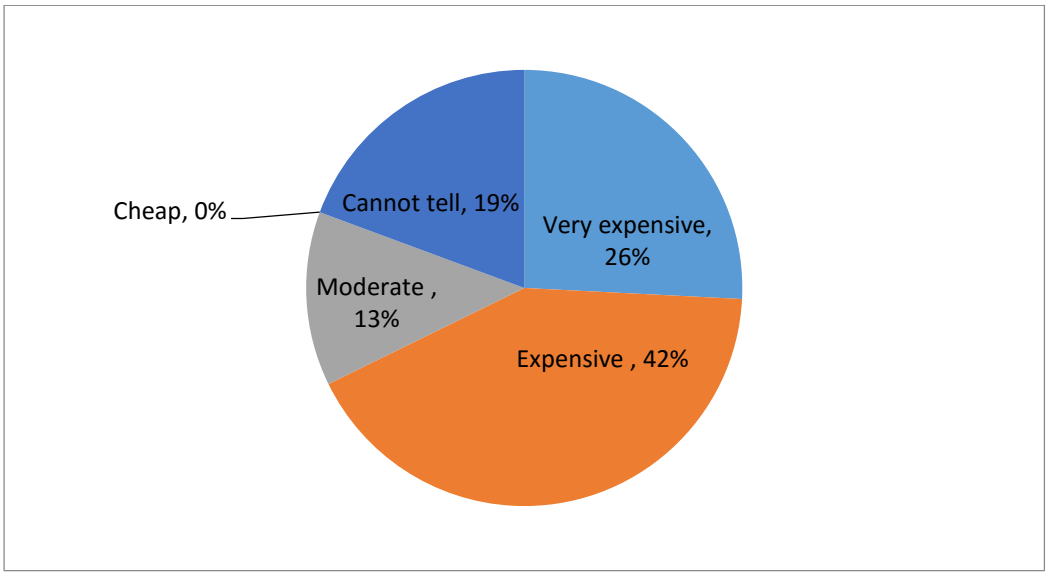

Figure 6 Pie Chart Showing the Cost of Fuel Compared to the cost of electricity provided by ECG

Data Source: Field Data

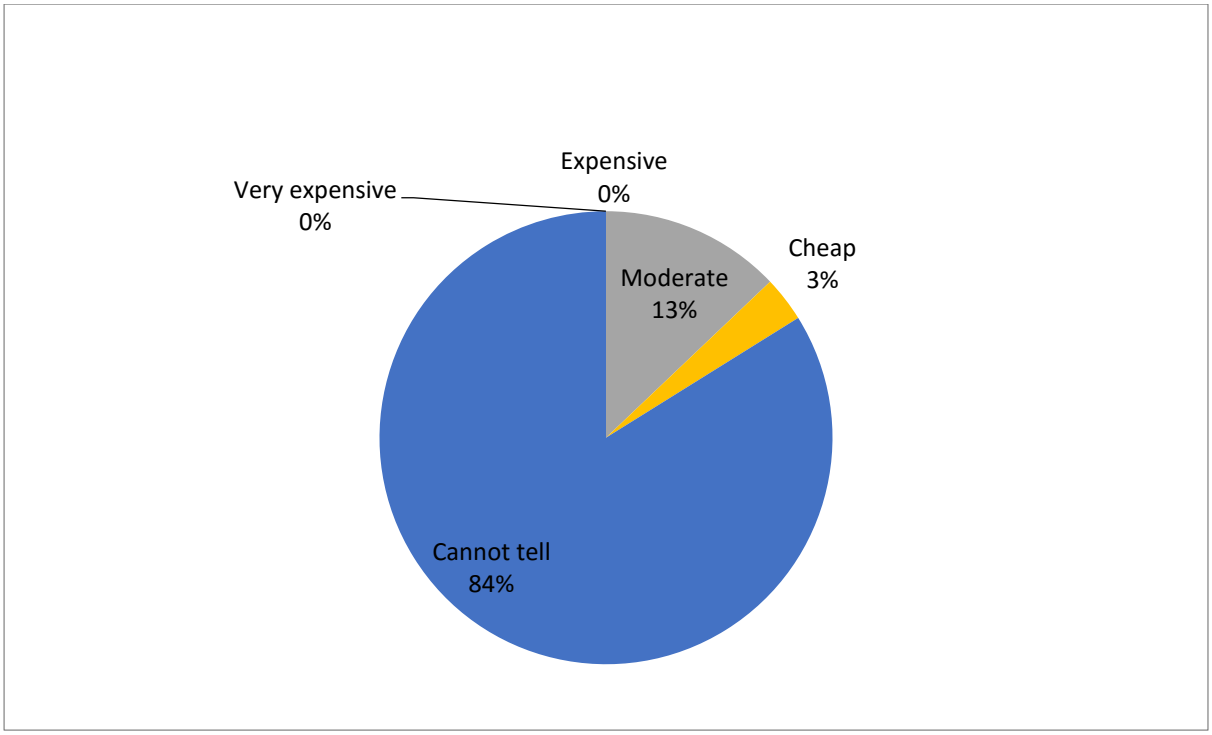

Figure 7 Pie Chart showing comparison of the Cost of Solar Power to the Cost of Electricity Provided by ECG by All Respondents

Data Source: Field Data

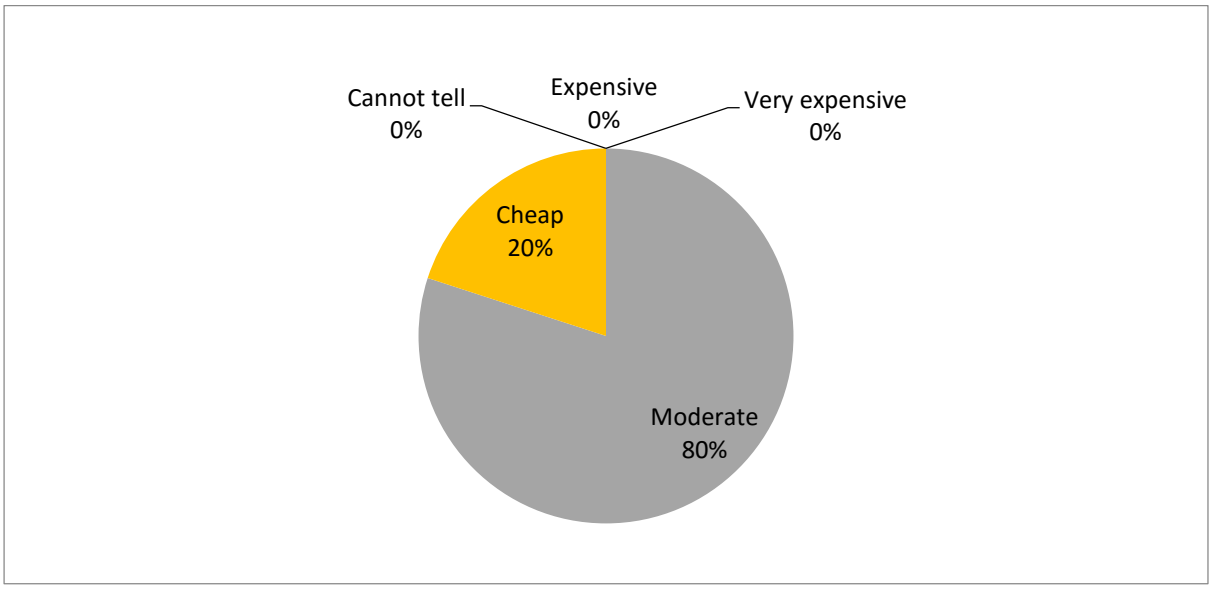

Figure 8 Pie Chart Comparing the Cost of Solar Power to the Cost of Electricity Provided by ECG by Only Respondents Who Use Solar Power

Data Source: Field Data

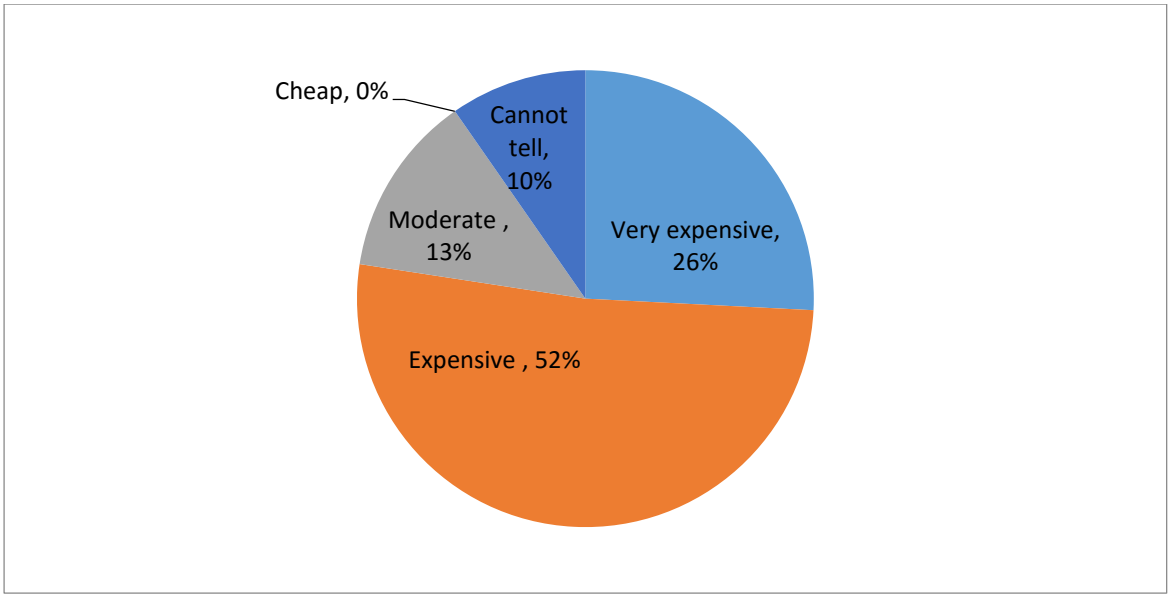

Figure 9 Pie chart showing respondent's comparison of the Price of Overall Coping Strategies to the Price Charged by ECG

Data Source: Field Data

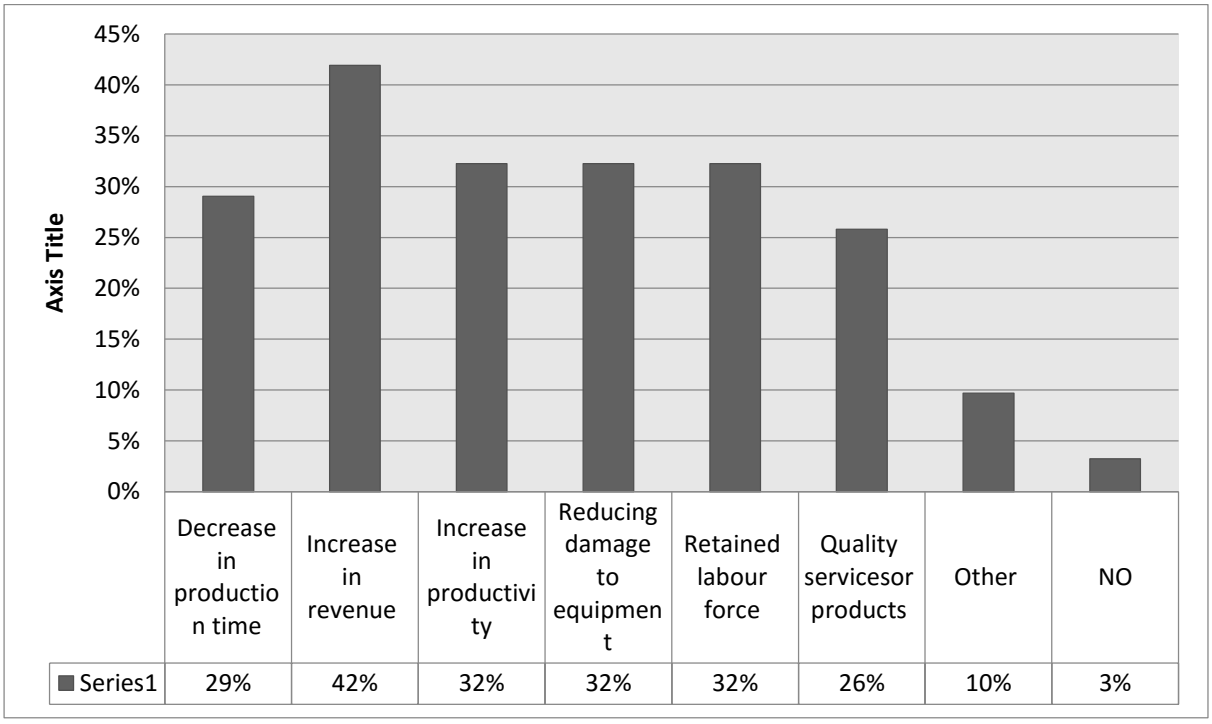

Figure 10 Bar Chart Illustrating the Positive Effects of Coping Strategies

Data Source: Field Data

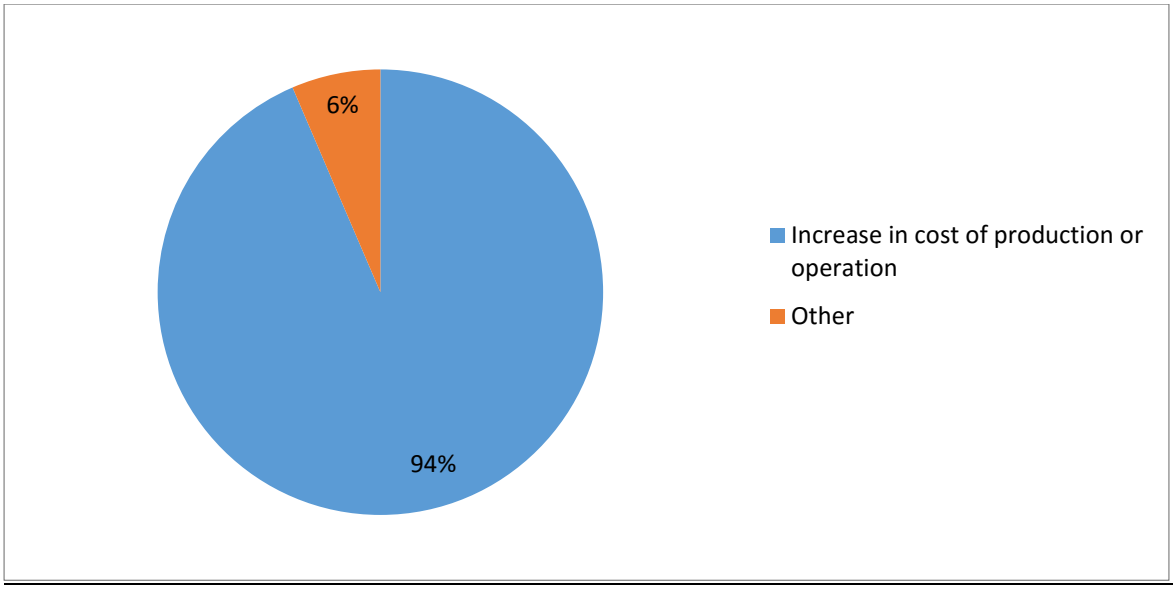

Figure 11 Pie Chart Sowing the Negative Effects from Adopting these Coping Strategies.

Data Source: Field Data

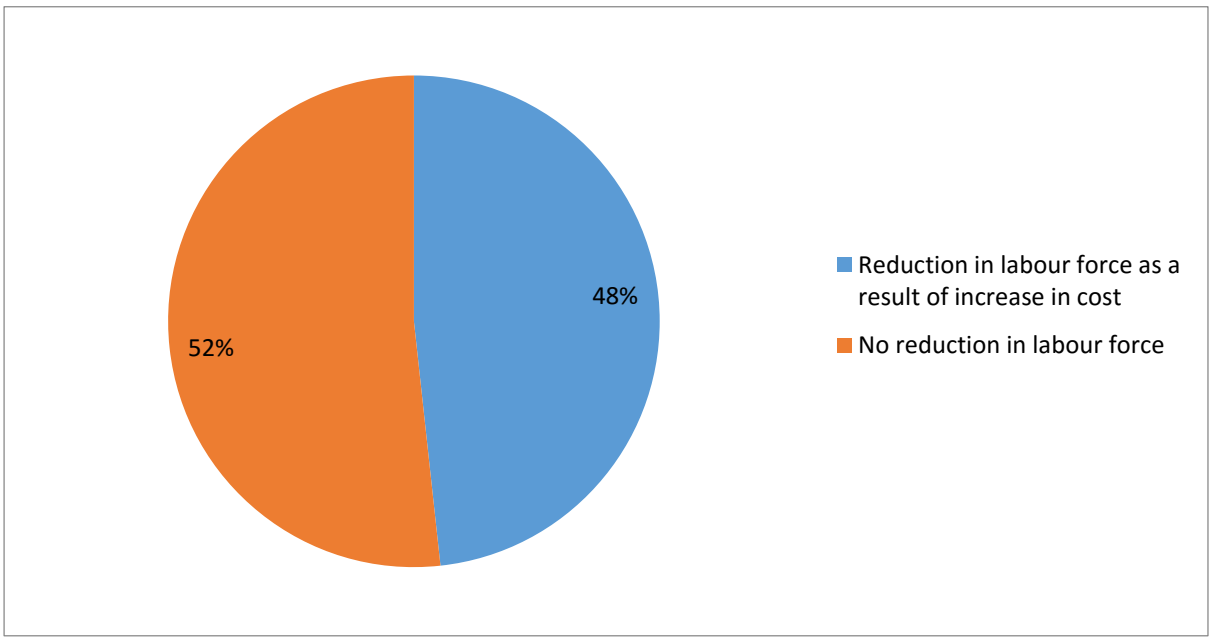

Figure 12 Pie chart showing the Percentage of Respondents that reduced their Labour Force as a Result of the Increase in Cost

Data source: Field Data

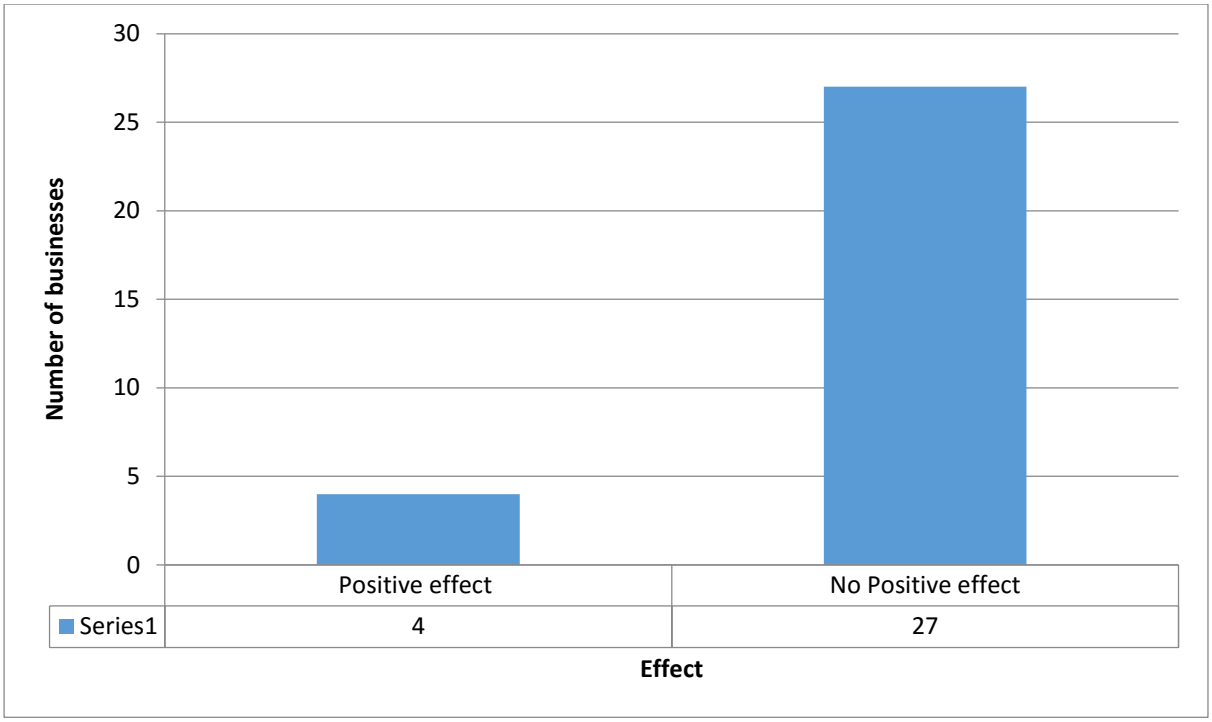

Figure 13 Bar graph showing the Number of Respondents the Load Shedding Had a Positive Effect On.

Data Source: Field Data

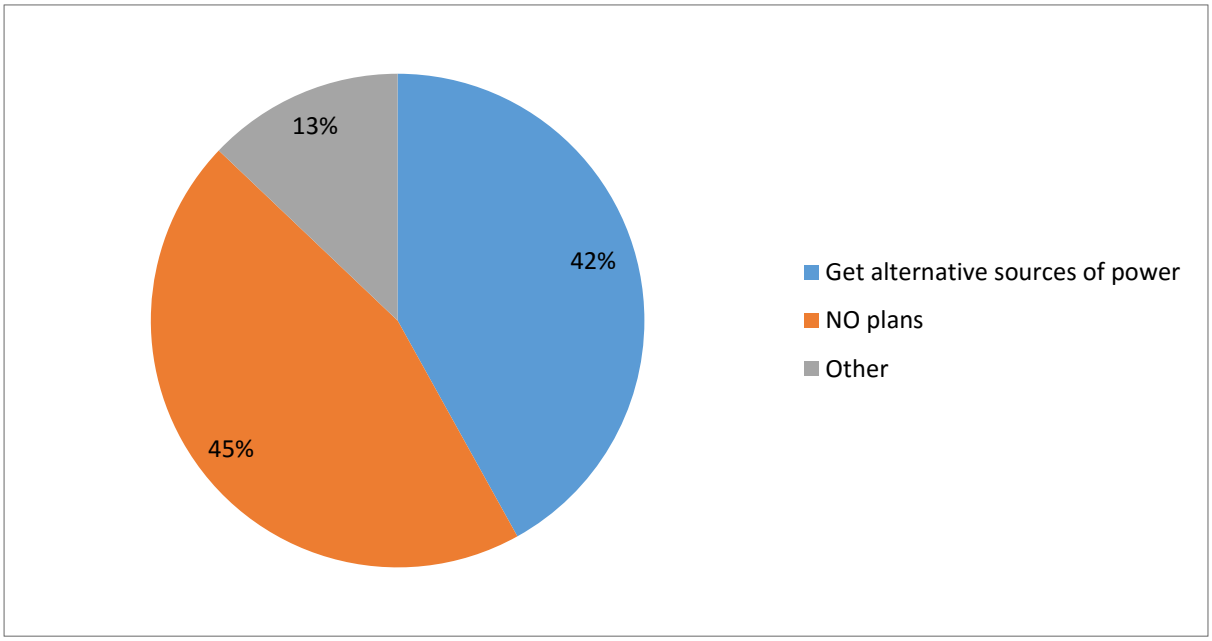

Figure 14 Pie chart Showing Respondents Plans for the Future of to survive the Load Shedding

Data Source: Field Data

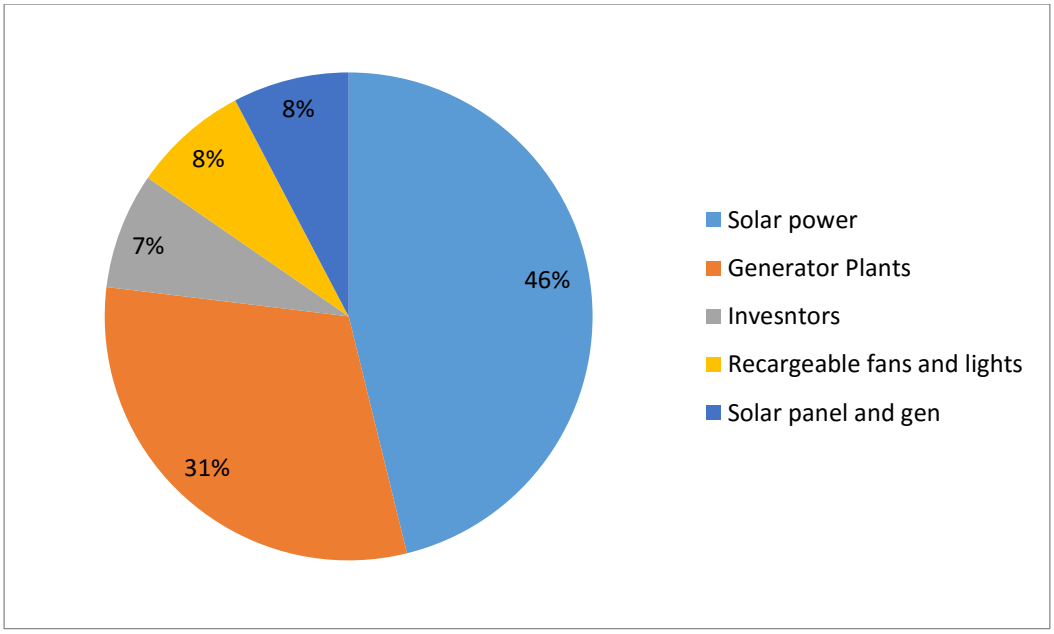

Figure 15 Pie chart Showing Future Alternative Sources of Power Planned by SMEs

Data Source: Field Data

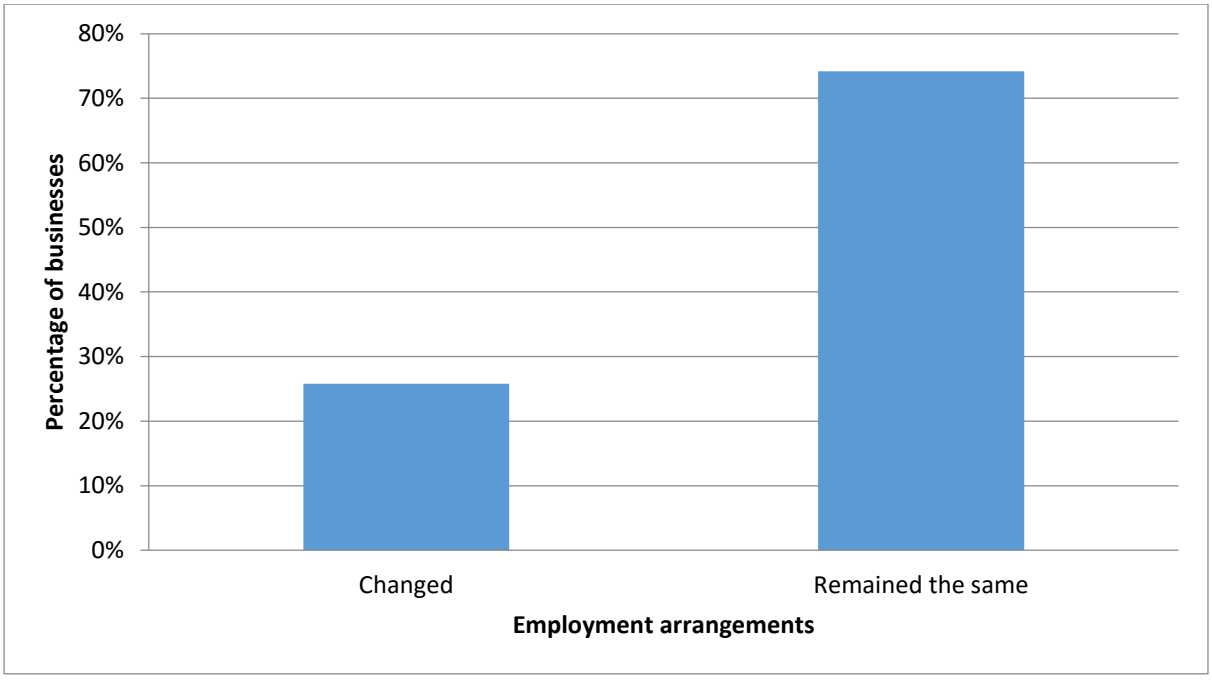

Figure 16 Bar Chart showing the percentage of respondents whose employment arrangements were affected by load shedding.

Data Source: Field Data.

Questionnaire

Date: __/__/____

Questionnaire

Topic: Assessing the effects of load shedding on small and medium scale enterprises in Madina, Accra: Coping Strategies.

Please answer the questions below based on the effects the load shedding of electricity is having on the business you own or manage. Please note that the confidentiality of any information you provide is guaranteed. Kindly read the preamble to each question if any before answering.

1. Is the current load shedding exercise affecting your business? Yes/ No. If yes in what way (s)?

   _____
   _____
   _____
   _____
   _____
   _____
   _____

2. Please rank in order the effects the load shedding of electricity is having on your business. 10= Worst effect and 1=least effect.

Impact on businesses	1	2	3	4	5	6	7	8	9	10
Increase in operation cost and cost of production										
Loss of production time										
Loss of revenue or money										
Decrease in productivity										
Damage to plant equipment										

Increased expenditure										
Reduction in labour force										
Overnight work										
Low quality service/product										
Other: Please State _____										

3. Has the load shedding of electricity increased or decreased employment in your enterprise? Increased or Decreased. If yes why?

_____

_____

_____

_____

_____

_____

_____

_____

_____.

4. Which coping strategy or strategies do you use in order to minimize the effects of the load shedding

Coping strategy	Please tick as many that apply
Generator	
Early closure	
Solar power	
Inventors	
Power banks	

Uninterrupted power Supplies	
Reducing labour force	
Combination. Please state combination	_____ _____.

5. Please rank the type of coping mechanism you use:
   8= Most important and 1=Least important

Coping Strategy	1	2	3	4	5	6	7	8
Generator								
Early Closure								
Solar power								
Inventors								
Power Bank								
Uninterruptible power supplies (UPSs)								
Reduction in labour force								
Combination. Please state _____								

6. Please state the reason why you chose to use this/these coping strategies rather than other measures.

   _____

   _____

   _____

   _____

_____

_____

_____

7. If you sometimes use a generator how many times did buy fuel

Number of times	Please tick one
1-2 times a week	
3-4 times a week	
5-6 times a week	
Everyday	
2 times a day	
More than 2 times a day	

8. How will you compare the price of fuel compared to ECG

	Please Tick One
Very Expensive	
Expensive	
Moderate	
Cheap	
Cannot tell	

9. How will compare the cost of solar power to ECG

	Please Tick One
Very Expensive	
Expensive	
Moderate	
Cheap	
Cannot tell	

10. How will you compare the cost of adopting this/these coping strategies to ECG?

	Please Tick One
Very Expensive	
Expensive	
Moderate	
Cheap	
Cannot tell	

11. What positive effects have the adoption of these methods had on your business

Positive effects	Please tick as many that apply
Decrease in production time	
Increase of revenue or money	

Increase in productivity	
Reducing damage to equipment	
Retained or Increasing labour force	
Quality service/ product	
Other. Please state. _____	

12. Please rank these benefits. 7= Most important benefit and 1= Least important benefit

Positive benefits derived from using coping strategies	1	2	3	4	5	6	7
Decrease in production time							
Increase of revenue or money							
Increase in productivity							
Reducing damage to equipment							
Retained or Increasing labour force							
Quality service/ product							
Other. Please state. _____ _____							

13. What negative effects have the adoption of these methods had on your business

Negative effects of adopting these coping strategies	Please tick as many that apply
Increase in cost of production and operation	
Reduction in labour force as a result of increased cost of operation	
Other. Please State. _____	

14. Please rate these negative effects. 3= most negative effects and 1= least negative effect

Negative effects of adopting these coping strategies	1	2	3
Increase in cost of production and operation			
Reduction in labour force as a result of increased cost of operation			
Other. Please State. _____			

15. Is the load shedding of electricity having any positive effect on your business? Yes/No
16. If yes, please state the positive effect the load shedding is having on your business.

_____

_____

_____

_____

_____

_____.

17. Are there other measures you plan to put in place in the future? If yes please state them along with the reason for choosing them.

_____

_____

_____

_____

_____

_____

18. Have employment arrangements between the business and workers changed since the start of the load shedding exercise? Yes/ No. If yes please state how they have changed.

_____

_____

_____

_____

_____

_____

Thank you for your time.

Types of Non-Probability sampling.

1. Quota sampling refers to a non-probability sampling technique in which the assembled sample has the same proportion of individuals as the entire population with respect to their known characteristics (explorable.com, 2016). The aim of quota sampling is to ensure that the strata of the sample being studied are proportional to the populations.

2. Convenience sampling is a sampling technique in which the researcher selects a sample which is easily available or easier to access. On the other hand, snowball sampling refers to the technique in which the researcher asks for help from respondents to identify the population under study (Laerd Dissertation, 2016). Snowball sampling is usually used when the population of the study is hidden or hard to find or identify.

3. Self- selection sampling is a sampling technique in which the researcher allows individuals or organisations to take part in the research based on their own accord through volunteering (Laerd Dissertation, 2016). Last but not least, purposive sampling refers to the technique in which the researcher selects a sample based on their knowledge of their research problem. The goal of purposive sampling is to focus on a particular characteristic of the population that will best help answer the question (Laerd Dissertation, 2016)

Types of validity

1. Internal validity refers to the whether or not a is able to establish and make a good conclusions about the casual relationship between two variables, with the purpose of definitely stating that the effects observed on the dependent variable is caused by the independent variable.

2. Construct validity on the other hand deals with the extent to which a study can make appropriate inference from the specific study to a broader concept on which the study was based operationalized measures for the theoretical construct on which they are based.

3. External validity on the other hand deals with the extent to which the conclusion drawn from a study can be generalised to the entire population.