BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SOCIAL SCIENCES DEPARTMENT OF PEACE AND GOVERNANCE

THE EFFECTIVENESS OF THE SOUTHERN AFRICAN POWER POOL IN ALLEVIATING ELECTRICITY SHORTAGES IN THE SOUTHERN AFRICAN COUNTRIES: A CASE OF ZIMBABWE AND SOUTH AFRICA

BY

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ABSTRACT

The major objective of the research was to assess whether SAPP has improved the availability of electricity in Southern Africa. The other sub objectives were to examine whether SAPP has facilitated the development of a competitive electricity, evaluate the extent to which SAPP has coordinated electricity trade in within the Southern African countries as well as establish the challenges faced by SAPP in alleviating electricity problem in Southern African countries. Southern Africa is facing its most severe power crisis in decades despite having the potential to generate enough energy to meet its demands and even export surplus. The idea was also to develop policy recommendations and methodologies that will enable Southern Africa to realize its energy potential. Southern Africa is characterized with high dependence on fossil fuels for its energy requirements and this has proved costly to the regional economies and its development priorities, yet the country is blessed with abundant resources with a great potential if tapped. Data gathering was done using self-administered questionnaires and interviews and analysis of existing relevant documents concerning the topic in question. The population of the study consisted of electricians, engineers, principal managers/managers and directors employed within Zesa, Min of Energy and Power Development, SA Embassy as well as Southern African Power Pool. From this target population, a sample of 94 participants was drawn and out of these. In this case, 70 (100%) questionnaires were distributed to the targeted population and only 64 were returned giving a response rate of 91.4%. It remains, that the overall response rate of 91.4% was achieved, which is sufficient to analyse the subject in hand. The reason for high response rate is attributed to the fact the topic was of interest to the respondents. SPSS and content analysis were used to process the data, thus a number of key findings emerged from this research. From the findings, it was shown that SAPP has made great strides in alleviating power shortages in the Southern African countries. The findings also indicated that progress was being undermined as a result of other factors which include inadequate infrastructure and lack of funding on the part of governments. The research also established that, the concept of energy democracy is possible to implement. The information from the research led to the following recommendations: Zimbabwe should improve its business climate; Policy consistency on the part of the governments; A sovereign wealth fund must be created to cater for new renewable energy projects; a. To alleviate the availability of electricity there is need for SAPP to provide more funds on maintenance of the existing and new infrastructure; to improve power generation SAPP member states must invest heavily in infrastructure development and maintenance; to enhance electricity availability SAPP must fulfil its objectives in order to achieve the intended goal of alleviating electricity shortages in Southern African Countries; in addition, SAPP must source funding and investment for capital intensive projects, most member states like Zimbabwe are not bankable and cannot easily get lines of credit but can benefit from loans extended to SAPP for projects since it has membership. Power generation should be decentralized just to name a few.

DECLARATION

I, B1953479 declare that the content of this dissertation is my own original work with the exception of such quotations or references which has been attributed to their sources and has not been previously submitted to any other university.

SIGNATURE……. **DATE…….**

APPROVAL FORM

The undersigned certify that he has read the project and has approve its submission for marking after conforming to the Faculty of Social Sciences and Humanities, Department of Peace and Governance and Master of Science Degree in International Relations requirements.

…….. ……..

Supervisor Date

DEDICATION

This research is dedicated to my family, husband, Children and my friends who gave me a lot of support and encouragement when this research was being carried out. The above missed me a lot during the time of writing this project.

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I thank God the Almighty, for providing me with grace, strength, guidance and wisdom that empowered me to finish my project. I would like to thank my wife and kids for providing the necessary assistance I needed to carry out my research. My profound acknowledgements to my supervisor for his commitment in coaching and for the constructive comments and suggestions which enabled me to come up with this dissertation. I would also love to acknowledge my friends who have also shown their unwavering support.

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Power pooling solutions have been hailed as the panacea for Africa's electrical crisis (Southern Africa included). The establishment of many power pools, such as the Southern African Power Pool (SAPP), the Eastern African Power Pool (EAPP), the Central African Power Pool (CAPP), the West African Power Pool (WAPP), and the North African Power Pool (NAPP), demonstrates this (SAPP, 2014).

The Southern African Power Pool (SAPP) was established in 1995 as Africa's first formal international power pool and is now the region's most sophisticated. SAPP's headquarters are in Harare, and its members include Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. The instruments that govern the SAPP are as follows: Inter-Governmental Memorandums of Understanding, Inter-Utility Memorandums of Understanding, Operating Member Agreements, and Operating Guidelines (SAPP, 2013).

The SAPP is the result of efforts to promote energy development as part of the Southern African Development Community's (SADC) political goal of regional integration, which was established in 1992. The primary goal of the SAPP is to provide reliable and cost-effective electricity to the consumers of each of the SAPP members, while remaining mindful of natural resource use and environmental impact. It enables the development of a competitive electricity market in the Southern African region, ensures that the Southern African region is the preferred location for energy-intensive users to invest. It also ensures sustainable energy development through sound economic, environmental, and social practices (Malik and Kuba, 2013).

The SAPP aims to: reduce costs while maintaining reliability, autonomy, and self-sufficiency in the planning and operation of electricity power systems; increase interconnectivity between SADC countries to improve power supply reliability; and harmonize relationships between member utilities to facilitate cross-border electricity trading (Malik, and Kuba, 2013). Furthermore, it provides a forum for the development of a world-class, robust, safe, efficient, reliable, and stable interconnected electrical system in the Southern African region; co-ordinate and enforce common regional standards of quality of supply, measurement, and monitoring of system performance; facilitate the development of regional expertise through training programs and research; increase power accessibility in rural communities.

A catastrophic drought that afflicted Southern Africa in 1992 also prompted the formation of SAPP. The drought hit SADC's hydropower providers hard, including Zambia, Malawi, and Zimbabwe (Karaki, 2017). The consequent power constraints highlighted the importance of energy cooperation between northern hydro-rich countries and southern thermal-rich ones. The desire to establish a regional pool arose from a convergence of interests within Southern African countries, which wanted to make more money from its energy surplus, and importing countries, which wanted to ensure a reliable and affordable supply of electricity to their citizens and industries when hydropower capacity was limited (SAPP, 2013).

According to Barnett et al., (2016), a regional power pool enables countries to: better connect supply and demand for electricity by expanding the geographic scope of energy markets; optimize the use of regional generating resources and improve the reliability and affordability of electricity in Sub-Saharan Africa; increase the economic efficiency of the energy sector

through competition effects from different suppliers; and attract investors to the energy sector through opportunistic investment opportunities.

Despite the existence of SAPP, Southern African countries such as Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe suffer from unpredictable power supply and the financial costs of power outages. Using the realist lenses by leading realist Hans Mogenthau, despite the countries coming together to pool up resources, the state is a unitary actor and will always put their national interest first. Leaders no matter what their political persuasion recognise this as they attempt to manage their state's affairs in order to survive in a competitive environment (Crawford, 2000). Therefore, the implication of this theory in this study is that it recognizes SAPP countries as the primary players in international arena, as they are concerned with continuously making choices to increase their own capabilities while undermining the capabilities of others. Leading realists like Carr, Mongenthau and Waltz have argued that state preferences are fixed. Most assume that states at a minimum seek their own preservation and, at a maximum, drive for universal domination.

In sum, realists view the world as one of constant competition for control over scarce good. The ability of a state to do this successfully is proportional to its underlying power, which is defined in terms of its access to exogenously varying material resources. Realists have long argued that control over material resources in world politics lies at the core of realism. This is what made Morgenthau, Waltz and Gilpin to declaim that the central premise of realism is the autonomy of the political. To stretch it further, it means that material resources constitute a fundamental reality that exercises an extraneous influence on state behaviour no matter what states seek, believe or construct. It is also documented that over 57 percent of the population

of these countries now lacks access to electricity, with 80 percent of the population living in rural areas. This raises the cost of productive economic activity, impeding long-term and equitable development. Those who do have access to energy, however, often pay exorbitant costs for a supply that is both insufficient and unreliable.

Similarly, Zimbabwe's electricity supply situation, although diverse, looks generally bleak. The country has suffered from electricity shortages, over the past decades and had to resort to load shedding as a stop-gap measure (SADC and SARDC, 2016). This has been a concern to the government of Zimbabwe in that despite having a strong relationship with South Africa which is operating a surplus, the country is facing electricity supply deficit with severe implications for economic growth. Zimbabwe's electricity is generated internally from hydro power plant at Kariba and thermal power plants from Hwange, Bulawayo, Munyati and Harare. The internal sources are augmented by imports from Mozambique, South Africa, Zambia and Democratic Republic of Congo (DRC). It is also noted with concern that out of a total installed capacity of 1960MW, about 1400MW is available from internal sources against Zimbabwe national demand of 1800MW and a peak demand of 2100MW. This clearly suggests that the national demand for electricity far outstrips internal generation which is augmented by imports of up to 500MW. Therefore, it is prudent to conduct this study with an ultimate aim to find how effective SAPP is to alleviate electricity problem in the Southern Africa.

1.2 Statement of the problem

Although Zimbabwe and South Africa are members of SAPP, they are suffering from unreliable electricity generation and supply, and the economic cost of power outages. The electricity generation capacity in Zimbabwe is very low as it is estimated at 940MW against a peak demand of 2200MW. This has led the countries to import 1640 MW of its power,

including 100 megawatts from the Democratic Republic of Congo, 200 megawatts from Mozambique. In addition, close to 80% of the overall population of these countries are currently without electricity access, 60 percent of whom live in rural areas. At the same time, those with access to electricity are typically facing high prices for a supply that is both insufficient and unreliable. Therefore, the question that needs to be answered is "how effective is the SAPP in alleviating electricity problem in Zimbabwe, South Africa and other Southern African Countries?

1.3 Research Aim

The main aim of this study is to assess the effectiveness of the SAPP in alleviating electricity problem in Southern Africa using Zimbabwe and South Africa.

1.4 Objectives of the study

The research objectives of the study are to:

1. Assess whether SAPP has improved the availability of electricity in Southern Africa.
2. Examine whether SAPP has facilitated the development of a competitive electricity.
3. Evaluate the extent to which SAPP has coordinated electricity trade in within the Southern African countries.
4. Establish the challenges faced by SAPP in alleviating electricity problem in Southern African countries.

1.5 Research questions of the study

The research questions of the study are as follows:

1. Has SAPP improved the availability of electricity in Southern African countries?

2. To what extent has SAPP facilitated the development of a competitive electricity market?

3. To what extent has SAPP coordinated electricity trade within its member countries?

4. What are the challenges faced by SAPP in alleviating electricity problem in Southern Africa?

1.6 Significance of the study

This research is motivated by a desire for the SAPP's initiatives to be effective in addressing the southern region's electricity shortfall. As a result, the current study may be beneficial to the researcher, other researchers, and SAPP members in Southern Africa. In the following ways, the research would be helpful and significant to the researcher: To begin with, the researcher would gain valuable knowledge as a student, which would aid in his professional development. The researcher's desire is to contribute to the creation of knowledge. The findings of the study would thus provide a solid foundation for the researcher and other researchers who might want to conduct additional research. The study is one of a kind, it serves as a stimulus for more research, and it will contribute to the current literature. The research is part of a Master of Science in International Relations program that will enhance the researcher's academic credentials and knowledge base.

SAPP members would benefit from the research because it might give vital knowledge for international collaboration and integration. Furthermore, the findings of this study can be used to develop new tactics or to phase out ones that are no longer relevant. As a result, it may be beneficial for the SAPP to review their strategies on a regular basis, as this will aid them in planning and managing activities, as well as evaluating performance and achieving their objectives. Furthermore, this research could serve as a foundation for the university's

acquisition of new knowledge, as well as a new foundation for a higher academic or university ranking.

1.7 Assumptions of the Study

The assumptions of the study are:

- SAPP has improved the availability of electricity within its member countries.
- SAPP has facilitated the development of a competitive electricity market in Southern Africa
- SAPP has enhanced electricity trade relations within the SADC countries.

1.8 Delimitations of the Study

The study was confined to the Southern Africa Region namely Zimbabwe and South Africa and the focus of the study will be on the effectiveness of the Southern African Power Pool in alleviating the shortage of electricity Southern Africa Region only. It covered a period of 5 years (2016-2021). The study was confined to participants from ZESA, Ministry of Energy and Power Development, Southern African Power Pool and the South African Embassy.

1.9 Limitations of the Study

It is useful to set the parameters, in terms of what this study intends to do. The study was faced with the following limitations.

Corona 19: Access to libraries for search of secondary data was a challenge as most libraries had restrictions due to the COVID-19 pandemic. Access to participants for in-depth interviews was also controlled due to the corona virus restrictions. The researcher largely resorted to the internet as the source of secondary data. Furthermore, the researcher could not conduct group discussions and group interviews for the respect of the law or lockdown regulations aimed at

curbing the spread of the Corona virus hence the use of telephone interviews was preferred and where necessary one on one interviews.

The study was limited to mixed approach method that allows the researcher to get a deep understanding of the effectiveness of the SAPP in alleviating electricity shortages in the southern African region from 2016 to 2021.

1.10 Chapter outline

The study consists of the following sequence of chapters:

Chapter 1: Introduction

The introductory orientation chapter aimed at familiarizing the reader with the whole research study. The main purpose is to define the statement of the problem and outline the aim of the study as well as to justify why it is necessary to carry out this investigation.

Chapter 2: Review of Related Literature.

Chapter 2 deals with a literature review of issues in line with the research questions, objectives and research topic.

Chapter 3: Research Methodology

Chapter 3 deals with the strategies that the researcher followed to gather data in order to answer the research question. Furthermore, data collection techniques such as interviews, and documentary analysis employed by the researcher will be explained.

Chapter 4 Data Presentation, Analysis and Discussion

The chapter present, analyse and discuss data from the research field. An attempt will be made by the researcher to link the research findings to what the reviewed literature findings in chapter 2 entailed.

Chapter 5: Summary, Conclusions and Recommendations

The Chapter draws conclusions based on the study findings, makes recommendations and summary of the study.

1.11 Definition of key terms

❖ Accessible population: The population from which the researcher can realistically select subjects for a sample, and to which the researcher is entitled to generalize findings.

❖ Alternative Hypothesis: The experimental hypothesis stating that there is some real difference between two or more groups. It is the alternative to the null hypothesis, which states that there is no difference between groups.

❖ Anonymity: a research condition in which no one, including the researcher, knows the identities of research participants.

❖ Assumption: Any important assertion presumed to be true but not actually verified; major assumptions should be described in one of the first sections of a research proposal or report.

❖ Attitude: scale A set of statements to which the participant responds.

❖ Autonomy: The capacity to think, decide and act on the basis of such thought and decision freely and independently and without let or hindrance.

❖ Bar graph: A graphic way of illustrating differences among groups.

❖ Behaviorism: school of psychological thought concerned with the observable, tangible, objective facts of behavior, rather than with subjective phenomena such as thoughts, emotions,

or impulses. Contemporary behaviorism also emphasizes the study of mental states such as feelings and fantasies to the extent that they can be directly observed and measured.

❖ Beliefs: ideas, doctrines, tenets, etc. that are accepted as true on grounds which are not immediately susceptible to rigorous proof.

❖ Bibliography: A list of the books referred to in a research project. It usually appears at the end, or as a separate section, known as an appendix.

❖ Case Study the collection and presentation of detailed information about a particular participant
or small group, frequently including data derived from the subjects themselves.

❖ Case Study: An intensive investigation of the current and past behaviors and experiences of a single person, family, group, or organization.

❖ Citation: The act of acknowledging or documenting a reference source used in preparing an assignment, report or project. It is also described as documentation. A full citation lists accurate information about author, title, publication date and related facts. There are a number of different citation styles.

❖ Closed Question: The question is followed by predetermined response choices into which the respondent's reply is placed.

❖ Closed-ended question: A question and a list of alternative responses from which the respondent selects; also referred to as a closed-form item.

❖ Conclusions: A brief summary of how the results of an experiment support or contradict a hypothesis.

❖ Confidentiality: Protection of the identity of human participants and their individual responses from disclosure.

❖ Consent: The process whereby a patient freely agrees without coercion or pressure to be involved in a research project.

❖ Consistency The process in surveys whereby a question should be answered similarly to previous questions.

❖ Constructivism the idea that reality is socially constructed. It is the view that reality cannot be understood outside of the way humans interact and that the idea that knowledge is constructed, not discovered. Constructivists believe that learning is more active and self-directed than either behaviorism or cognitive theory would postulate.

❖ Convenience samples: A sample that is easily accessible.

❖ Convenience Sampling (also referred to as Accidental Sampling) A non-probability sampling strategy that uses the most easily accessible people (or objects) to participate in a study.

❖ Convenience Sampling A sampling strategy that uses the most easily accessible people (or objects) to participate in a study. This is not a random sample, and the results cannot be generalized to individuals who did not participate in the research.

❖ Credibility: a researcher's ability to demonstrate that the object of a study is accurately identified and described based on the way in which the study was conducted.

❖ Data Analysis: The process by which data are organized to better understand patterns of behavior within the target population. Data analysis is an umbrella term that refers to many particular forms of analysis such as content analysis, cost-benefit analysis, network analysis, path analysis, regression analysis, etc.

❖ Data: Any information obtained about a sample or a population.

❖ Data Collection: The observation, measurement, and recording of information in a research study.

❖ Descriptive Statistics: Basic statistics used to describe and summarize data. Descriptive statistics generally include measures of the average values of variables (mean, median, and mode) and measures of the dispersion of variables (variance, standard deviation, or range).

❖ Effectiveness: Effectiveness describes how well a particular treatment or other intervention works to the benefit of the patient/research subject.

❖ Empirical: Based on observable evidence.

❖ Epistemology concerns knowledge construction; asks what constitutes knowledge and how knowledge is validated.

❖ Evaluation Research: The use of scientific research methods to plan intervention programs, to monitor the implementation of new programs and the operation of existing programs, and to determine how effectively programs or clinical practices achieve their goals.

❖ Generalizability the extent to which research findings and conclusions conducted on a specific study to groups or situations can be applied to the population at large.

❖ Hypothesis: A statement which research sets out to prove or disprove. There are two types of hypothesis: 'experimental' where the hypothesis is a positive statement, such as 'carers who attend a support group have better coping skills' or 'null' where the statement contains a negative statement, for example, 'carers who attend a support group do not have better coping skills.'

❖ Informed: Consent The agreement between concerned parties about the data-gathering process and/or the disclosure, reporting, and/or use of data, information, and/or results from a research experiment.

❖ Justification (of a study): A rationale statement in which a researcher indicates why the study is important to conduct; includes implications for theory and/or practice.

by the regression equation.

❖ Limitation: An aspect of a study that the researcher knows may influence the results or generalizability of the results, but over which he or she has no control.

❖ Literature Review: A comprehensive survey of the research literature on a topic. Generally, the literature review is presented at the beginning of a research paper and explains how the researcher arrived at his or her research questions.

which a study is conducted, thereby producing a threat to internal validity.

❖ Methodology: a theory or analysis of how research does and should proceed.

❖ Methodology (or Research Methods) A particular procedure or set of procedures. These may include the methods, techniques and instruments used in a research experiment.

❖ Mixed-method design A study combining quantitative and qualitative methods.

❖ Ontology a discipline of philosophy that explores the science of what is, the kinds and structures of objects, properties, events, processes, and relations in every area of reality.

❖ Open-Ended Data: Data derived from open-ended inquiries, such as interview questions, to which responses are not predetermined, such as would be the case with multiple choice or true/false

questions.

❖ Participant individuals whose physiological and/or behavioral characteristics and responses are the object of study in a research project.

❖ Pie chart A graphic method of displaying the breakdown of data into categories.

❖ Positivism A philosophic viewpoint emphasizing an 'objective' reality which includes universal laws governing all things including human behavior.

❖ Primary source: First-hand information such as the testimony of an eyewitness, an original document, a relic, or a description of a study written by the person who conducted it.

❖ Qualitative Data: Information gathered in narrative (nonnumeric) from (e.g. a transcript of an unstructured interview).

❖ Qualitative Research: A field of social research that is carried out in naturalistic settings and generates data largely through observations and interviews. Compared to quantitative research, which is principally concerned with making inferences from randomly selected samples to a larger population, qualitative research is primarily focused on describing small samples in non-statistical ways.

❖ Qualitative variable A variable that is conceptualized and analyzed as distinct categories, with no continuum implied.

❖ Quantitative data Data that differ in amount or degree, along a continuum from less to more.

❖ Questionnaire: A survey document with questions that are used to gather information from individuals to be used in research.

❖ Random sample: A sample selected in such a way that every member of the population has an equal chance of being selected.

❖ Random sampling: Methods designed to select a representative sample by using chance selection
so that biases will not systematically alter the sample.

❖ Random Selection: A technique used to choose subjects at random so as to get a representative sample of the population. In random selection, each individual in the eligible population has a fixed and determinate probability of selection into the sample.

❖ Random selection sampling: The process of selecting a random sample.

❖ Reliability: The extent to which a measure, procedure or instrument yields the same result on repeated trials.

❖ Representative Sample: sample in which the participants closely match the characteristics of the population, and thus, all segments of the population are represented in the sample. A representative sample allows results to be generalized from the sample to the population.

❖ Research design: The overall plan for collecting data in order to answer the research question. Also the specific data analysis techniques or methods that the researcher intends to use.

❖ Research hypothesis: A prediction of study outcomes. Often a statement of the expected relationship between two or more variables.

❖ Research Method: Specific procedures used to gather and analyses research data.

❖ Research Methodology: Different approaches to systematic inquiry developed within a particular paradigm with associated epistemological assumptions (e.g. experimental research, grounded theory, and ethnomethodology).

❖ Research Question: A clear statement in the form of a question of the specific issue that a researcher wishes to analyse.

❖ Research Question: A clear statement in the form of a question of the specific issue that a researcher wishes to answer in order to address a research problem. A research problem is an issue that lends itself to systematic investigation through research.

❖ Sample: the population researched in a particular study. Usually, attempts are made to select a "sample population" that is considered representative of groups of people to whom results will be generalized or transferred. In studies that use inferential statistics to analyze results or which are designed to be generalizable, sample size is critical, generally the larger the number in the sample the higher the likelihood of a representative distribution of the population.

❖ Sample Size: The number of subjects in a study. Larger samples are preferable to smaller samples, all else being equal.

❖ Sampling: A probability sampling strategy involving successive sampling of units (or clusters); the units sampled progress from larger ones to smaller ones (e.g. health authority/health board, trust, senior managers).

❖ Sampling Design: The part of the research plan that specifies how and how many respondents will be selected for a study.

❖ Secondary source: Second hand information, such as a description of historical events by someone not present when the event occurred.

❖ SPSS: One of a number of commercially available statistical packages.

❖ Survey Research: A research approach designed to collect systematically descriptions of existing phenomena in order to describe or explain what is going on; data are obtained through direct questioning of a sample of respondents.

❖ Target Population: The population to which the researcher would like to generalize her or his results based on analysis of a sample. The sample is selected from a target population.

❖ Theoretical Framework: The conceptual underpinning of a research study which may be based on theory or a specific conceptual model (in which case it may be referred to as the conceptual framework).

❖ Trustworthiness: A term used to describe whether naturalistic research has been conducted in such a way that it gives the reader confidence in the findings. It can be assessed using the criteria of credibility, dependability and transferability.

❖ Unstructured Interview: An interview in which the researcher asks open-ended questions. The researcher aims to give respondents the latitude to talk freely on a topic and to influence the direction of the interview. There is no predetermined plan about the specific information to be gathered from these types of interviews.

❖ Validity: the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. A method can be reliable, consistently measuring the same thing, but not valid.

ZESA : Zimbabwe Electricity Supply Authority

SA Embassy : South African Embassy

IPPs: Independent Power Producers

SAPP: Southern Africa Power Pool

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The previous chapter revealed the background of the study. This chapter reviews the literature related on the effectiveness of the SAPP in alleviating electricity problem in Southern African countries using Zimbabwe and South Africa as a case study. Literature review is a compilation, classification and evaluation of what other researchers have written on a particular topic. In this study, literature review provides the interpretation of existing literature in light of updated developments in the field to help in establishing the consistency in knowledge and relevancy of existing materials. It helps in calculating the impact of the latest information in the field by mapping their progress. It also brings out the dialects of contradiction between various thoughts within the field to establish facts. The literature review will be guided by the research objectives. The chapter is structured as follows: theoretical framework and empirical studies.

2.1 Theoretical Framework

The study will be guided by the realism and the liberalism theories.

2.1.1 Realism

Hans Morgenthau (1904–1980) developed the theory of realism (Campbell, 1995). The assumptions of realism are that the nation-state is the principal actor in international relations. Other bodies exist, such as SAPP, individuals and organisations, but their power is limited. The state is a unitary actor and realism suggests that all leaders, no matter what their political persuasion, attempt to manage their state's affairs in order to survive in a competitive environment (Crawford, 2000). Therefore, the implication of this theory in this study is that it

recognizes SAPP countries as the primary players in international arena, as they are concerned with continuously making choices to increase their own capabilities while undermining the capabilities of others. In this case, selfishness, appetite for power and inability to trust others leads to predictable outcomes and this is evidenced by that, despite the existence of SAPP, majority of Southern African countries suffer from unpredictable power supply and the financial costs of power outages. It is also documented that over 57 percent of the population of these countries now lacks access to electricity, with 80 percent of the population living in rural areas. This raises the cost of productive economic activity, impeding long-term and equitable development. Those who do have access to energy, however, often pay exorbitant costs for a supply that is both insufficient and unreliable.

2.1.2 Liberalism

Enlightenment philosophers are given credit for shaping liberal ideas. These ideas were first drawn together and systematized as a distinct ideology by the English philosopher John Locke, generally regarded as the father of modern liberalism (Kelly, 2005). Liberalism is a school of thought that emphasizes three factors that promote state collaboration and reduce conflict:

- International institutions, such as the SAPP, that provide a forum for non-violently resolving disputes over electricity in the southern region.
- International trade, because when countries' economies are interconnected through trade, they are less likely to go to war with one another.
- Spread of democracy, because well-established democracies do not go to war with one another, so if there are more democracies, interstate war will be less frequent.

Liberals believe that international institutions play an important role in interdependence-based cooperation among states (Shiraev, 2014). States interact in a variety of ways, including

economic, financial, and cultural means; security is rarely a priority in state-to-state interactions; and military forces are rarely used. It also emphasizes the use of international diplomacy to encourage member states such as those in SAPP to communicate honestly and promote development. Furthermore, the implication of the theory in this study is that it emphasis that with the right institutions and diplomacy, SAPP states can work together in generating and supply adequate electricity to alleviate the shortage of electricity among the member countries in the Southern Africa.

2.2 SAPP and electricity availability and efficiency

Due to its geographic location, Zimbabwe's power network provides a strategic hub for the transfer of power within the Southern Africa Power Pool (SAPP). ZESA is also part of the transmission interconnector project called Zimbabwe-Zambia-Botswana -Namibia, code named ZIZABONA which agreed on a project concept of developing a high voltage transmission infrastructure network linking the four countries (Dube, Chiguvare and Chipumho, 2007). The Medium-Term Plan (MTP) recommends that a substantial number of public resources be committed towards rehabilitation, maintenance and expansion of key infrastructure in the power sector (Rafemoyo, 2010). The main objective in the short-to-medium term is to restore and increase power generation capacity to meet national demand. This can be achieved through rehabilitation and expansion of Hwange and Kariba by 2012, resuscitation of small thermals and upgrading of the transmission and distribution power grid. Implementation of demand side management is expected to create 300MW, capacity which is almost equivalent to that of combined small thermals. Installation of pre-paid meters and enhancement of billing system is expected to enable ZESA to enhance revenue collection since customers would be compelled to pay for the service upfront and result in the availability of electricity.

The REA is expanding the grid to the rural areas implying that the demand for electricity would increase (Dube, Chiguvare and Chipumho, 2007). Electricity in rural areas should be seen beyond lighting households; grinding mills and business centres can benefit a lot, through facilitation of creation of cottage industries. Schools and clinics also benefit from access to electricity. It was noted that although it may seem to be cost ineffective to extend the grid to rural areas instead of pursuing wind and solar energy, the issue of sustainability has to be considered. Solar and wind energy cannot adequately sustain cottage industries and cannot be used for cooking. Zimbabwe is also making strides towards establishing Independent Power producers (IPPs) to ease the electricity shortage in the economy by exporting excess power to the national grid (Rafemoyo, 2010).

2.3 SAPP and the development of a competitive electricity market

The SAPP regional market platform started in 2001 with the Short-Term Energy Market (STEM) (Vanheukelom and Bertelsmann-Scott, 2016). The Short-Term Energy Market (STEM) designed to be day-ahead, compliments the bilateral market and provides another technique for the pricing of electrical energy in SAPP. The goal of standard market design is to establish an efficient and robustly competitive wholesale electricity marketplace for the benefit of consumers (Turkson, 2002). This could be done through the development of consistent market mechanisms and efficient price signals for the procurement and reliable transmission of electricity combined with the assurance of fair and open access to the transmission system. For the design of the STEM, the following criteria were submitted as input: Long and short-term bilateral contracts between participants have priority over STEM contracts for transmission on the SAPP interconnectors. All the STEM contracts are subject to the transfer constraints as verified by the SAPP Coordination Centre.

There are currently three energy contracts that have been promoted in the STEM as follows; monthly, weekly and daily contracts. To commence the design process, three working groups were tasked to detail the parameters for settlements (Treasury Working Group), the parameters for trading (Trading Working Group) and the parameters of governance (Legal Working Group). The working groups were composed of specialists from the participating utilities. The work was conducted over a period of one year.

Muntschick, (2013) argues that the system was succeeded in 2009 by the Day Ahead Market (DAM). Wright, (2017) adds that the DAM was complemented in 2016 with the Intra Day Market (IDM). In support, Rose et al., (2016) adds that the IDM enables trades up to one hour prior to delivery, which allows utilities to adapt their purchasing volume if they failed to cover their needs in the DAM. The DAM is an auction-type market. It allows utilities to weight their options and ensure that when it is cheap to get power from the market, utilities will buy it rather than generate power. This helps SAPP members to bid on and sell electricity. The regional energy market therefore gradually introduced innovations to make the market mechanism more responsive among the Southern African countries. This resulted in an expansion of regional market share from 0% of the total of total cross-border trade in 2009 to 6% in 2015(Kayo, 2001).

In 2015 the SAPP started upgrading the market trading platform in preparation for the intra-day market and forward physical markets (Vanheukelom and Bertelsmann-Scott, 2016). In addition, the SAPP opened for live trading in intra-day market (IDM) trading platform from the 1st December 2015. Furthermore, SAPP has also introduced Forward Physical Monthly (FPM_M) and forward Physical Weekly (FPM-W) markets during the month of April 2016.

Bilateral contracts still account for more than 90 percent of all energy traded in the Southern region (Turkson, 2002). They usually range from one to five years and the pricing of electricity depends on the consumption period peak, standard and off-peak periods – as well the negotiating capacity of the countries involved. Bilateral Trading Based on intergovernmental agreements, the general trading arrangement in SAPP is for the national utilities to engage into long term bilateral contracts for the sourcing and consumption of electrical energy. The intergovernmental agreements and the bilateral contracts form the foundation for cross border electrical energy trading (Kayo, 2001). The routine activities that follow include scheduling, settlements and the monitoring of quality of supply. For the bi-lateral contracts, the pricing of electrical energy is negotiated and the outcome is generally based on the classical economics of supply and demand. At times of peak consumption, the price for electrical energy is generally higher and lower during off-peak times. The off-peak tariff in most countries is approximately 40% of the peak tariff. This difference promotes new business opportunities.

As bilateral trade increases, expanded participation by third parties also can grow. One such example is efforts to expand power trade between Eskom and ZESA with Mozambique as a transit country (ZETDC, 2009). Beyond that, market-based power trading can grow through participation by other countries' suppliers rapidly developing power exchanges, and eventually in the development of region-wide exchanges. This level of electricity cooperation can bring significant benefits in terms of incentives to produce and price power efficiently and flexibly.

The electricity industry in Zimbabwe has been opened to competition in the generation supply sector with Transmission, Distribution and Supply retaining monopoly for now. The electricity industry was opened to competition in the generation sector in 2002 and the participation of

the independent power producers has been slow as may be reflective of need for securitization of power generated, lack of capacity of licensed IPPs to attract finance, high financial costs for IPPs leading to high expected tariffs and difficulties in getting insurance for secured loans by investors. As such no major power stations have been commissioned since unbundling (Turkson, 2002

2.4 SAPP and coordination and electricity trade

The SAPP has enhanced regional integration the development of technical infrastructure (Turkson, 2002). Liberals believe that international institutions play an important role in interdependence-based cooperation among states (Shiraev, 2014). This is so because notable progress has been made in developing the regional electricity infrastructure since the creation of the SAPP in 1995, from the transmission networks to the trading platforms. By creating a regional power market, regional energy cooperation in theory allows countries to: better connect supply and demand for electricity by expanding the geographic scope of energy markets; optimise the use of regional generating resources and improve the reliability and affordability of electricity in Sub-Saharan Africa; increase the economic efficiency of the electricity sector through competition effects from different suppliers; attract investors to the energy sector through opportunities to benefit from economies of scale and address social equity, through affordable energy from modern energy infrastructure.

SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries (Turkson, 2002). The aim is to provide an integrated power transmission grid and energy market across countries that can create and exploit economies of scale in the generation, transmission and distribution of electric power (Woolfrey, 2016). This permits positive spillover effects across the different regions with

benefits that are greater than those that could be generated by individual governments acting alone (Andrews-Speed, 2011). This has enabled Zimbabwe to import electricity from regional peers, South Africa and Mozambique, as well as generally through the Southern African Power Pool (SAPP), a grouping of the region's major power stations. New generation capacity projects are under construction and some are being commissioned. These include the Hwange 7 and 8 coming online by 2022, independent power producers, about 60 megawatts by end of year whist others are at different levels of project development.

SAPP has improved Zimbabwe relations with other countries in that it has facilitated cross-border power trading. Trading allows Zimbabwe to buy and sell electricity through an existing network of transmission lines and relay substations (Turkson, 2002). This enables the exchange of power from those countries that have energy surpluses. To ensure all countries benefit from this initiative, the SAPP has resolved to fast track the implementation of priority regional transmission projects in order to connect the three remaining countries to the regional grid.

SAPP helped Zimbabwe to better manage its electricity deficit by accessing more than one supplier, and importing electricity at a lower cost than producing it themselves (Turkson, 2002). The limited size of their domestic power markets indeed offered limited opportunities for economies of scale in electricity production (World Bank, 2007; Castalia, 2009). Electricity producers get access to larger markets, and can avoid excessive grid losses by selling to customers close to where electricity is produced. Zimbabwe since it has an electricity deficit or limited generation potential is accessing reliable electricity from outside their borders. Grid development at scale allows Zimbabwe to save resources by reducing its dependence on portable solutions and expensive and often outdated thermal power plants.

Member state contributions to collective action will depend on the cost and benefit evaluation of the various available outcomes as well as on the expectations regarding the choices of other actors (Eyita, 2014). The most basic motive driving states is survival, states are instrumentally rational and unitary actors (Mearsheimer 1994/95: 9-10). Realism therefore, suggests that all leaders, no matter what their political persuasion, attempt to manage their state's affairs in order to survive in a competitive environment. Selfishness, appetite for power and inability to trust others leads to predictable outcomes (Crawford, 2000). These different national interests can lead to the 'collective action' required to achieve regional public goods a difficult endeavor (Kayo, 2001). The slow progress in the development of regional energy trading platforms illustrates the effect of these issues. Small importing countries such as Zimbabwe may be reluctant to accept exposure to short-term international market prices through the inter-day market and may prefer most trades to occur under long term bilateral contracts at fixed prices to benefit from more predictability (Turkson, 2002). This may explain the lack of trading in the day-ahead market of SAPP and the overall preference for bilateral arrangements (Oseni, 2014). Power pools are also about liberalising national energy market - making it competitive.

2.5 Challenges faced by SAPP

The SAPP revealed that electricity projects are capital intensive projects and long term, requiring huge capital investment as well as long term commitment (Beta, 2016). Financing for the electricity sector is a challenge due to the long-term nature of the projects. Thus, electrification in Zimbabwe is also far from complete, which further complicates the incentives to go regional. Financing plays an important role in the infrastructure development in African power pool regions. SAPP face challenges to finance the construction of new power stations

since the power utility ZESA has no financial capacity to fund these huge capital projects on their own (Dube, Chiguvare and Chipumho, 2007).

Interconnections come at a cost that is not invested in the generation of additional electricity (Beta, 2016). Building interconnections also brings additional costs for utilities and other energy producers as generators need to be adjusted to accommodate utilities elsewhere on the regional grid (Kayo, 2001). Unless there is a mechanism to compensate countries that bear additional cost in adjusting their distribution capacity to include other utilities, there may be limited short-term motivation to incur such costs (Rafemoyo, 2010). Countries often favour the construction of new infrastructure projects, over maintaining existing ones, which is explained by their different nature as regional public goods (Andrews-Speed, 2011). This is the case in Zimbabwe where lack of meaningful investment in additional generation capacity and charging of a suboptimal tariff have been compounded by maintenance deficiencies in existing plants, transmission system losses and the rising demand of on average 3% per annum.

In addition, there is a challenge of an aged and obsolete equipment and poor state of infrastructure as well as vandalism of the power network infrastructure hamper the efficient generation and distribution of electricity (Rafemoyo, 2010). The power utility is also not spared by skills shortages especially in professional and technical grades due to human capital flight in search of greener pastures. There is also lack of adequate working capital to support Hwange Power Station refurbishments and small thermals to unlock their full generation potential. Small thermals are expensive to run at an average cost of US13c/kWh, compared to about US5.6c/kWh for Hwange Power Station (Turkson, 2002).

The above literature indicates that SAPP has made some strides in connecting the region as well as expansion of the infrastructure but the available literature is still lagging behind in

showing the progress made within the region as well as measures SAPP has taken to manage the demand side of electricity. Electricity availability is not only about generating power but the member countries also have to make sure generated power is not lost due to infrastructure issues as well as inefficient use of power. Over and above, the studies carried out before were based on a case study research which is susceptible to bias when the researcher's personal opinions and preferences interfere with the collection and analysis of data. The data will also be lacking scientific rigour and providing little basis for generalization of results to the wider population. Researchers' own subjective feeling may influence the case study (researcher bias). Difficult to replicate, time-consuming and expensive. This study however will be a survey study and survey study include having a large population and therefore a greater statistical power, the ability to gather large amounts of information and having the availability of validated models

2.6 Chapter summary

The chapter reviewed literature on whether SAPP has improved the availability of electricity in Zimbabwe; Namibia and South Africa. SAPP has facilitated the development of a competitive electricity market in Zimbabwe; SAPP has coordinated Zimbabwe, Namibia and South Africa's electricity trade relations with the other SADC countries and the challenges faced by SAPP in alleviating electricity problem in Zimbabwe. The next chapter focuses on the research methodology of the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research paradigm, the research approaches, research design, the target population, the sample size and sampling techniques, the data collection instruments, validity, reliability and ethical considerations and data presentation, analysis procedures.

3.2 Research Philosophy

This study is guided by Pragmatism Philosophical tradition. It is a philosophical tradition that very broadly understands knowing the world as inseparable from agency within it. This general idea has attracted a remarkably rich and at times contrary range of interpretations, including: that all philosophical concepts should be tested via scientific experimentation, that a claim is true if and only if it is useful (relatedly: if a philosophical theory does not contribute directly to social progress then it is not worth much), that experience consists in transacting with rather than representing nature, that articulate language rests on a deep bed of shared human practices that can never be fully 'made explicit'.

3.3 Research Approach

There are three types of research approaches namely qualitative, quantitative and mixed approach. For the purpose of this study the researcher to choose a mixed method approach. Mixed method approach is the latest alternative research trend which combines qualitative and quantitative research methods, in order to provide 'a better understanding of research problem than either approach alone (Creswell, 2013). In this study mixed methods enabled the

researcher to collect and analyse data, and integrate the findings using both qualitative and quantitative approaches. This corroborates findings by Charmaz, (2014) who postulates that both quantitative and qualitative methods are actually compatible, meaning that the two can be used within a single study. In addition, the researcher used multiple ways to explore on the effectiveness of the SAPP in alleviating electricity shortages Southern African countries. This is because the researcher believes what works best in a particular situation should always be used in that scenario regardless of any assumptions that can arise in relation to that particular situation.

In this study qualitative research methods were used to answer questions about experience, and perspectives on how effective SAPP is in alleviating electricity shortages in the Southern African countries from the standpoint of the participant. The approach enabled the researcher to generate and analyse interviewed data. In depth interviews were used to solicit qualitative data from the participants while. Quantitative approach was generally used to collect numerical data through the use of closed ended questions. The questionnaire with closed questions was used in this study to enable respondents to participate independently and their responses will be generalised.

3.4 Research Design

Research design is a plan or strategy of research and the logic behind it will make it possible and valid to draw more general conclusions from it (Charmaz, 2014). Creswell (2013), defines research design as the conceptual structures within which the research is conducted. It constitutes the blueprint for the collection, measurement and data analysis of the data. The research design for this study is both descriptive and diagnostic research simply because it is concerned with describing the characteristics of a particular individual, whereas diagnostic

research studies determine the frequency with which switching occurs. The design helped the researcher to get relevant data to achieve the objectives of the study.

A survey strategy was adopted for this study as it provides a quantitative or numeric description of trends, attitudes or opinions of a population by studying a sample of that population. In this case, survey research designs are procedures in quantitative research in which the researcher administered a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviours, or characteristics of the population. The researcher administered a cross-sectional survey where data was collected at one point from the selected sample. This concurs with Creswell (2013) who notes that surveys are useful in describing the characteristics of a large population and no other research method can provide this broad capability, which ensures a more accurate sample to gather targeted results in which to draw conclusions and make important decisions. Survey design enabled the researcher to describe the characteristics of the study population and ensure a more accurate sample to gather results in which to draw conclusions and make important decisions. Thus, the survey design enabled the researcher to gather primary data which made it easy to analyse on the effectiveness of SAPP in alleviating electricity shortages in the Southern African countries.

3.5 Target Population

Population is the group to whom one wants to apply the results of the study (Saunders, *et al.*, 2012). Charmaz (2014) further defines population as an entire count of people or objects with characteristics under study. The target population of this study was comprised of 940 staff members from SAPP; Ministry of Energy, South African Embassy and ZESA employees who are knowledgeable about the area of study.

3.6 Sample

Sampling is the process of finding people or places to study; to gain access to study; and to establish a rapport so that participants provide relevant data (Cresweell, 2013). A sample is a small portion of a population selected for observation and analysis, (Kothari, 2004). Charmaz, (2014) also defines a sample as a group that is chosen from a population from which to collect data. In this case, sampling is a process of selecting representative subset of observations from a population to determine the characteristics of the random variable under investigation and the aim was to get a sample that is as representative as possible of the target population. Thus, once a sample was scientifically taken, the result was generalized to the entire population.

3.6.1 Sampling Procedure

For the purpose of this study, convenience sampling technique was used. Convenience sampling is a type of non-probability or non-random sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study (Creswell, 2013). In support, Collins (2010) adds that convenience samples are sometimes regarded as 'accidental samples' because elements may be selected in the sample simply as they just happen to be situated, spatially or administratively, near to where the researcher is conducting the data collection. However, besides the criticism of convenience sampling such as biased and the problem of outliers, the researcher believes that convenience sampling is affordable, easy and the subjects are readily available. In this case, convenience sampling allowed the researcher to collect information from participants who are easily accessible to the researcher at a relative cost and time in comparison to probability sampling techniques. Thus, this enabled the researcher to achieve the sample size in a relatively fast and inexpensive way.

Furthermore, the convenience sample also helped the researcher to gather useful data and information that would not have been possible using probability sampling techniques, which require more formal access to lists of populations. The technique is mostly less expensive and allowed the researcher to select knowledgeable respondents who expressed their opinions on the issues without any difficulty.

3.6.2 Sample size

Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. As Kothari (2004) states it is seldom necessary to sample more than 10% of the population to obtain adequate confidence in your generalization. In this study, the researcher used the 10% of the population to obtain a sample of 94 people comprised of 14 staff members from SAPP; 10 Ministry of Energy, 10 from South African Embassy and 50 ZESA employees. The researcher used convenience sampling also known as "accidental sampling" leading to more workers from Zesa selected for the research as they were accessible and willing to participate. Easy accessibility, geographical proximity, availability at a given time, or the willingness to participate were very key in the selection of the sample from the target population.

3.7 Data collection methods

Data collection methods can be defined as ways used in the measurement or observation procedures when researching a phenomenon (Collins, 2010). Creswell, (2013) also defines research methods as tools used to collect data from the research subjects. Since the study is mixed, these data collection methods can be classified as quantitative and qualitative methods as explained below:

3.7.1 In-depth Interviews

In this study personal interviews were conducted as a follow up to the questionnaires and this helped to solicit data from the 30people drawn from Zesa, SAPP; Ministry of Energy and Power Development, and the Embassy. Saunders *et al.,* (2012) define personal interview as face-to-face semi structured interviews that are used as a second tool to get deeper understanding of the study and supplement the main data gathering technique. It can be further noted that interview method yields a great deal of useful information and allows the researcher to use verbal and non-verbal cues, to clarify doubts and ensured that the interviewee's responses are clearly understood by repeating or rephrasing their answers to questions. Thus, it enabled the researcher to have access to "what a person thinks" (attitudes and beliefs).

Creswell (2013) argues that there are two major types of interview formats: structured and unstructured. Saunders *et al.,* (2012) assert that the structured or formal interview is when set of questions are asked by the interviewer and answers from the respondents are recorded in a standardized form. The unstructured or informal interview is used for discovering or exploring issues of interest to the researcher (Collins, 2010). Subsequently, the questionnaire survey was modified and used as a semi-structured guide. The bulk of the respondents who were selected for the interview also participated in the questionnaire survey. The main advantage of the interview was that the researcher managed to have face- to- face interaction with the respondents. In depth interviews enabled the researcher to capture a lot of meaning and depth from both the spoken word and bodily expressions which revealed hidden convictions.

Saunders *et al.,* (2012) noted that with "interview", respondents seem reluctant to turn down an interviewer standing on their doorsteps than to throw away a mailed questionnaire. In this

study, the presence of the interviewer reduced the number of do not knows or no answer at all. However, the greatest strength of an interview is that it probes further than what the respondent would have given and unclear questions will be clarified. Interviews were expensive to conduct and time consuming to the researcher and the presence of the interviewer introduced bias because the participants needed to please the researcher.

3.7.2 Questionnaires

Collins, (2010) defines a questionnaire as a pre-formulated written set of questions to which respondents record their answers. Creswell (2013) defines questionnaires as forms with questions related to a particular topic of interest to the researcher. Thus a questionnaire is an efficient data collection tool when the researcher knows exactly what is required and how to measure the variables of interest. The distinctive feature of a questionnaire is that it is answered without assistance. The researcher took cognisance of the advantages of using the questionnaire such as its usefulness. The researcher used simple language and make the instrument simple. Confidentiality was guaranteed through ensuring anonymity. In this research, the name of the respondent was not required.

Creswell (2013) asserts that a questionnaire is very important as it is able to reach a large population. Thus, it is easy to collect information from scattered respondents including those beyond the physical reach of the researcher at a relatively low cost. The researcher notes that questionnaires allow anonymity which tends to encourage honest responses where sensitive areas are involved. Furthermore, questionnaires were more objective and convenient as respondents complete at their own time and pace. The researcher thinks that the questionnaire reduced bias because there was less interaction between the respondents and the researcher. There was inadequate opportunities to build rapport with respondents. Saunders *et al.,* (2012)

noted that this makes it difficult to follow up non- return omissions and inadequate answers. Further probing of answers to questions or clarifications of unclear questions will not be possible when using questionnaires. Thus, the questionnaire makes it difficult for the researcher to judge how serious the respondents will be in the research exercise. The questionnaire were broadcasted to 30 ZESA employees in Zimbabwe. In this study the researcher used both the questionnaires and interviews to collect data because of their suitability.

3.7.3 Response Rate

Table 3.1 below represents the summary of the questionnaire response rate. This response rate was calculated by comparing the number of questionnaires distributed to the targeted population with the number of questionnaires returned. In this case, 70 (100%) questionnaires were distributed to the targeted population but only 64 were returned giving a response rate of 91.4%. It remains, that the overall response rate of 91.4% was achieved, which is sufficient to analyse the subject in hand. The reason for high response rate is attributed to the fact the topic was of interest to the respondents. In addition, Babbie (2012) notes that a response of over 50% is sufficient for an analysis although there is no agreement among researchers on how many respondents are enough in survey research.

The researcher used the following formula to calculate the response rate:

$$\textit{Response rate} = \frac{\textit{Absolute Frequency x 100\%}}{\textit{Targeted Responses}}$$

Table 3.1 Questionnaire Response Rate (N=64)

Category	**Frequency**	**Percentage**
Number of questionnaires not returned	6	8.6%

Number of questionnaires returned	64	91.4%
Number of questionnaires distributed	70	100%

Source: Questionnaire field data

3.7.4 Validity

Validity of research instrument refers to whether the instrument measures what it purports to measure (Collins, 2010). The researcher conducted pre-testing and the responses to the research questions. This helped the researcher to identify items characterized by difficulties and ambiguity. These were corrected hence the quality of research instruments was improved. Integrity of the data was adhered to through the quality control that ensured the highest possible level of data integrity together with findings that were totally relevant to the study objectives. The researcher also maximised validity of the research instruments by: avoiding the use of technical terms that may have confused the respondents; ensured that questions provided alternative answers to avoid mental strain; avoided unsuitable questions for the desired outcome and phrasing questions which were ambiguous and arranged them from simple to complex.

3.7.5 Reliability

Silverman (2004) defined reliability as the degree to which the findings of the research are independent of accidental circumstances. It is closely related to assuring the quality of field notes and guaranteeing the public access to the process of the publication of the research results. Reliability is defined as it refers to the extent to which the same results are obtained when responses are measured at different times (Charmaz, 2014). Therefore, reliability in this study

referred to the consistency of measurement over time that provided the same results on repeated trails. In order to have reliability the researcher conducted a pilot study. The questionnaire and the interview schedules were pilot tested to 7 people who are also specialist in international relations.

Table 3.2 Reliability Test

Cronbach's Alpha	Internal Consistency
$a \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq a < 0.9$	Good (Low- Stakes testing)
$0.6 \leq a < 0.7$	Acceptable
$0.5 \leq a < 0.6$	Poor
$a < 0.5$	Unacceptable

Source: Goforth (2015)

Table 3.3 Reliability Statistics of the Instrument (Questionnaire)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
1.000	1.000	30

Table 3.2 and 3.3 given above shows the reliability statistics of the instrument. The reliability is 1 which is greater than 0.9 (According to the Cronbach's Alpha scores' level) that reflects excellent (high-stakes testing) reliability of the measuring instruments. Furthermore, it indicates high level of internal consistency with respect to the specific sample.

3.7.6 Trustworthiness

Saunders *et al.,* (2012) define trustworthiness as it refers to the demonstration that the evidence for the results reported is sound and when the argument made based on the results is strong. Trustworthiness has become an important concept because it allows researchers to describe the virtues of qualitative terms outside of the parameters that are typically applied in quantitative research. In order to maintain high trustworthiness in this study, the researcher followed the laid down criteria in-order to ensure valid interpretation of data:

- truth value;
- applicability;
- consistency, and
- neutrality

However, the true value was measured by credibility: having an adequate engagement in the research setting so recurrent patterns in data can be properly identified and verified. Thus, trustworthiness was achieved by maintaining high credibility and objectivity.

3.7.7 Credibility

The credibility criteria involve establishing that the results of qualitative research are credible or believable from the perspective of the participant in the research (Charmaz, 2014). Since from this perspective, the purpose of qualitative research is to describe or understand the phenomena of interest from the participant's eyes, the participants will be allowed to judge the legitimately and credibility of results. In this study credibility refers to the extent to which a research account is believable and appropriate, with particular reference to the level of agreement between participants and the researcher. In this case, the researcher will strive for data saturation by collecting and analyzing data on an ongoing basis, continually comparing to see if new ideas, constructs, and themes arise or if the same notions re-emerge. The researcher

will subject the data to triangulation through multiple analysts and ‘member checks’ since credibility is involved in establishing that the results of the research are believable (Collins, 2010).

3.7.8 Dependability

Dependability ensures that the research findings are consistent and could be repeated (Charmaz, 2014). This is measured by the standard of which the research is conducted, analysed and presented. Each process in the study should be reported in detail to enable an external researcher to repeat the inquiry and achieve similar results. This also enables researcher to understand the methods and their effectiveness. In this case, the researcher account for the ever-changing context within this research occurs. The researcher will be responsible for describing the changes that occur in the setting and how these changes affect the way the research approached the study.

3.7.9 Conformability

Qualitative research tends to assume that each researcher brings a unique perspective to the study. In this study conformability refers to the degree to which the results could be confirmed or corroborated by others. There are a number of strategies for enhancing confirmability (Charmaz, 2014). The researcher will document the procedures for checking and rechecking the data throughout the study. Furthermore, the researcher will take a "devil's advocate" role with respect to the results, and this process will be documented. The researcher will actively search for and describe and negative instances that contradict prior observations. And, after the study, the researcher will conduct a data audit that examines the data collection and analysis procedures and makes judgements about the potential for bias or distortion.

3.8 Data Presentation and Analysis

From the questionnaire data which was collected from the closed sections was presented quantitatively and data from the open-ended questions and from in depth interviews will be analysed qualitatively. The researcher also examined the quantitative raw data using SSP, Microsoft and descriptive statistics. This data was categorized and presented in tables, pie charts and graphs and narrations as well as themes to address the purpose of the research study. Percentages were used to summarise responses from the study.

Data analysis is a process of inspecting, cleansing, transforming, and modelling data with the goal of discovering useful information, informing conclusions. This data was analyzed using the computer package, Statistical Package for Social Sciences (SPSS) Version 17 and Excel spread sheets. Descriptive statistics were used to analyze continuous and categorical data.

3.9 Ethical Considerations

Ethics is concerned with the creation of a trusting relationship between those who are researched and the researcher (Kothari, 2004). To ensure that trust is established it is essential that communication is carefully planned and managed, that risks are minimised and benefits are maximised. They help to determine the difference between acceptable and unacceptable behaviours on the part of the researcher. The readers and the public want to be assured that researcher followed the appropriate guidelines for issues such as human rights, animal welfare, compliance with the law, conflicts of interest, safety, health standards and so on. The handling of these ethical issues greatly impacts the integrity of the research project (Creswell, 2013). Therefore, the researcher respected the following ethical issues

In this study, the researcher promoted informed consent through informed refusal. Furthermore, the researcher explained the purpose, condition of the research and request their consent. Thus, the researcher ensured that participants are not coerced to participate in this study without their consent.

The researcher also considered confidentiality. The researcher ensured that the rights of the research subjects are protected. In addition, the researcher kept faith with the participants who participated in this study. To gain confidence from the participants the researcher made the position clear to the subjects. Thus, the researcher kept the promises that enable the research subjects to disclose relevant information without fear.

Deception means not telling people that they are being researched, not telling the truth, telling lies, or compromising the truth (Collins, 2010). It may also lie in using people in a degrading or dehumanizing way (Creswell, 2013). The researcher informed the subjects and did not expose them to unduly painful, stressful or embarrassing experiences without their knowledge. Thus, the researcher avoided deception by telling the whole truth. Furthermore, in taking the research ethics into account, the researcher also introduced himself with the aid of a student card, introductory letter from the Bindura University of Science Education (BUSE). The researcher also promised respondents that their responses would not be used against them nor used to discredit them or their business.

An invasion of privacy happens when private information such as beliefs, attitudes, opinions and records, is shared with others, without the individual's knowledge or consent (Collins, 2010). A researcher cannot decide on behalf of other persons on those delicate issues. All aims, instruments and methodology must be discussed with the prospective subject and the research workers prior to the investigation (Charmaz, 2014). Creswell (2013) states that whenever

subjects refuse to report personal information as they regard it an invasion of privacy, the researcher ought to respect their views. This may even apply to report of age, income, marital status, and other details that the subject may regard intimate. They also imply that privacy can be invaded when researchers study certain groups without their knowledge and without identifying themselves. Clearly, the researcher considered the setting in which the data collected to avoid undue invasion of privacy. For example, data concerning sexual preference was avoided.

3.10 Chapter summary

This chapter described the research philosophy, approach and research design used. The target population, sample and sampling technique and the sample size were also discussed. Data collection methods were well stated and the justification for the use of questionnaires and in-depth interviews. Trustworthiness, credibility and dependability; validity and reliability of the study were also discussed. Ethical issues were considered. The next chapter 4 will present data analysis and discusses the findings.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

The main aim of this study is to assess the effectiveness of the SAPP in alleviating electricity problem in Southern Africa using Zimbabwe and South Africa as a case study Data gathered in the research, an analysis of the information and a discussion of the findings from the research are presented in this chapter. The data will be analysed from research findings generated from questionnaires, interviews and secondary documents in line with the research objectives and corresponding questions. Data is presented in tables, pie charts and graphs.

4.2 Bio-data

4.2.1 Gender

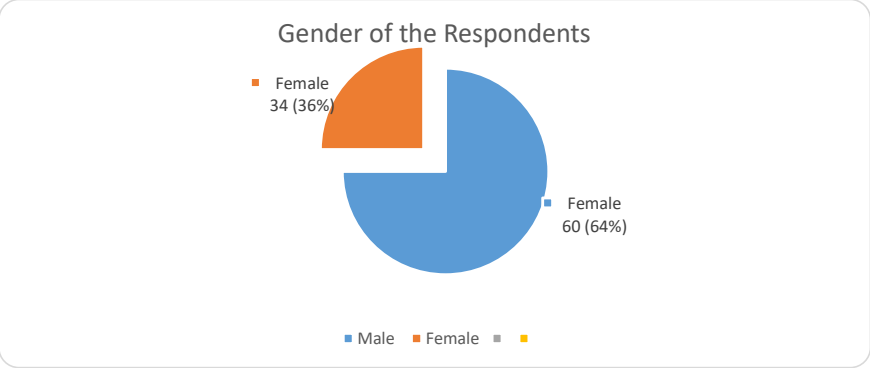

Figure 4.1: Gender (No= 94)

Figure 4.1 above represents the distribution of respondents according to gender. Ninety-four, (100%) respondents responded and were comprised of 34 (36%) females and 60 (64%) males.

The analysis shows that males were the majority who had interest to the question understudy and this could be attributed to the energy industry being mostly dominated by males.

4.2.2 Age

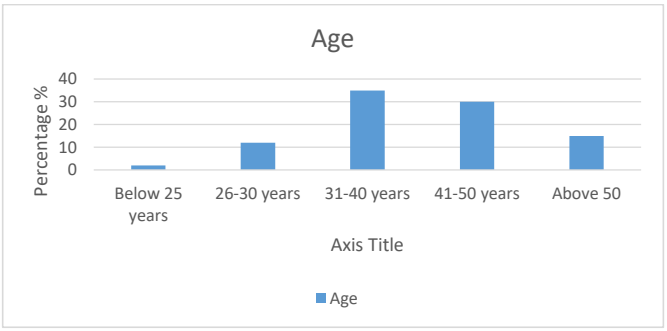

Figure 4.2: Age (No= 94)

Most of the respondents 35(37.23%) were aged between 31-40 years while the least number of respondents 5(5%) were aged 25 years and below as illustrated on Figure 4.2. The majority of the respondents were aged between to 31- 40 year age group which is an age group in their prime of their careers and with richness in knowledge required for the study.

4.2.3 Education Profile

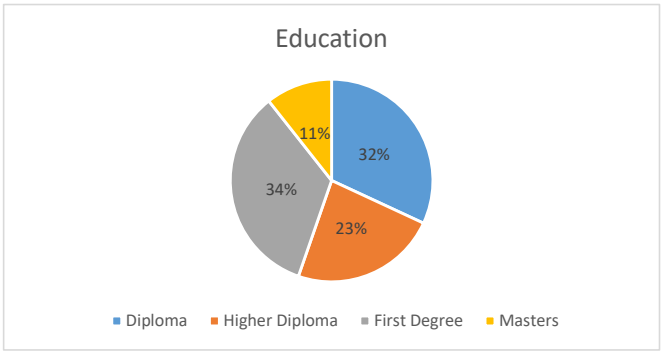

Figure 4.3: Education Profile (No= 94)

On Figure 4.3 above, the majority of the respondents 32 (34%) were First degree holders while the least number of respondents 10 (10.7%) were Master's degree holders. 10% consisted of managers who possess Masters degrees whilst the majority were electricians who are mostly diploma and degree holders.

4.2.4 Work experience

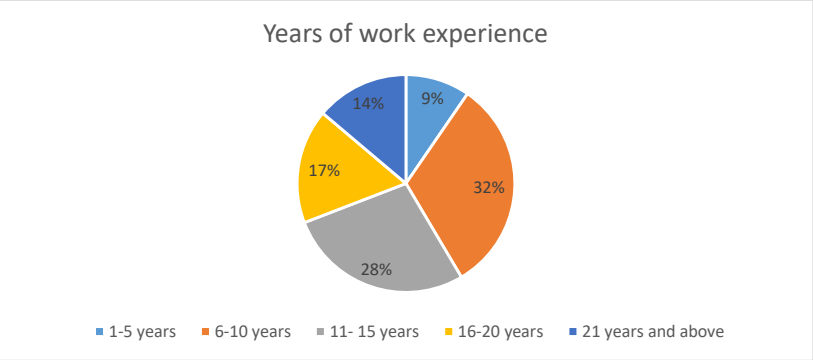

Figure 4.4: Work Experience (No= 94)

Most of the respondents 30 (32%) fell in the 6-10 years of work experience category while the lowest number of respondents 9 (9 %) fell in the 1–5-years of work experience category as illustrated on Figure 4.4 above.

4.2.5 Profession

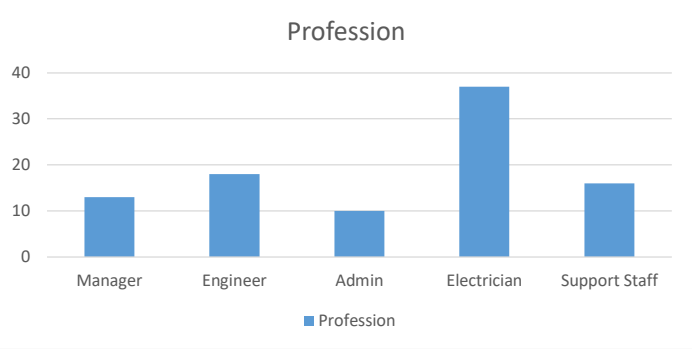

Figure 4.5: Profession (No= 94)

Figure 4.5 above represents the distribution of respondents according to profession. Electricians constitute the highest number 37 (39.4%) respondents while admin staff constituted the lowest number of respondents 10 (10.8%).

4.3 SAPP and electricity delivery in Southern Africa

The first objective of this study was to assess whether SAPP has improved the availability of electricity in the Southern African countries. In order to achieve this objective, respondents were asked the following statements illustrated in table 4.1 below:

Table 4.1 SAPP and electricity delivery in Southern Africa (N=64)

Statement	Agree F %	D/A F %	SA F %	SDA F %	No idea F %
The SAPP carries out maintenance of the existing infrastructure	15 (23%)	12 (19%)	20 (31%)	10 (16%)	7 (11%)
Expansion of key infrastructure is growing in Sothern Africa	15 (23%)	4 (6%)	40 (63%)	5 (8%)	0 (0%)
Establishment of IPPs is on the rise within the SAPP members	20 (21%)	3 (5%)	30 (47%)	6 (9%)	5 (8%)
SAPP members are exporting excess power to the national grid	20 (31%)	5 (8%)	25 (39%)	4 (6%)	10 (16%)
Use of compact fluorescent lamps (CFLs) is being implemented in order to manage the demand side of electricity (demand side management)	15 (23%)	5 (8%)	30 (47%)	4 (6%)	10 (16%)

4.3.1 Maintenance of existing infrastructure

The question sought to establish whether SAPP carries out maintenance of existing infrastructure. Data on whether SAPP carries out maintenance of existing infrastructure is presented in Table 4.1 above. The presentation shows that the majority of respondents 35 (54%)

strongly agree that SAPP is conducting maintenance of existing infrastructure while 22 (35%) of the respondents felt that SAPP is not doing enough to maintain the existing infrastructure due to financial constraints and inability to retain human capital resources. This was also noted in interviews:

A Ministry of Energy and Power Development, Energy Specialist said that:

> *The honours is with the member country to make sure the infrastructure meets the standards required by the SAPP in order to be able to participate meaningfully and avoiding power losses as a results of faulty and aged equipment. To a greater extent yes, the member countries are doing their best to maintain the existing infrastructure given the circumstances.* (Interview with Min of Energy Engineer, 2022).

In another interview with a Zesa Engineer, same sentiments were echoed as the Engineer is quoted saying that:

> *Definitely due to requirements by the SAPP organisation, you can't afford to operate infrastructure that you do not maintain, safety issues related to you becoming a member becomes a big issue if infrastructure is not maintained. Not maintaining leads to incurring of huge losses as the network is prone to accidents to both internal and external stakeholders which also goes against the vision of supplying safe and reliable electricity. You'll also understand on our Zimbabwean side how important maintenance of the national grid is as it plays an integral part in the interconnection and linking countries. Definitely there's a lot of maintenance going on within the country and the region at large* (Interview with Zesa Engineer, 2022).

The results above from both interviews and questionnaires indicated that SAPP members are indeed maintaining Infrastructure. However, in Zimbabwe, political conflict and economic contraction have undermined the power system as investment resources have dried up. Overall, countries in conflict perform worse in the development of infrastructure than do countries at peace (Yepes, Pierce, and Foster 2008).

4.3.2 Expansion of key infrastructure growth

The question sought to establish whether expansion of key infrastructure is growing in Southern Africa. Data on whether expansion of key infrastructure is growing in Southern Africa is presented in Table 4.1 above. From the above data collected, 55 (86%) of respondents were in agreement.

A Southern Africa Power Pool official said:

> *There is great deal of expansion projects currently going on in the country and the region at large, we have the Hwange 7 and 8 which will be coming to the grid soon with unit 7 expected to come in around end of December adding around 300 Megawatts and is currently at testing phases and the unit 8 expected to add another 300 megawatts first quarter next year. Indeed, the governments through partnerships have made great strides in expansion of existing infrastructure. Zimbabwe through ZETDC a subsidiary of ZESA Holdings is also constructing 2 by 420kv powerlines from Hwange to Insukamini in Bulawayo and also is part of the national grid. The Batoka Gorge project is also being fast tracked so that construction can commence soon as the project will be a game changer in the electricity supply withing the region expected to add about 2000 megawatts.* (Interview with SAPP Official, 2022).

From the findings of both interviews and questionnaires we can deduce that SAPP members are indeed carrying out expansion projects. This is further supported by the SAPP (2021) that SAPP has made great strides in expanding infrastructure within its members and this is evidenced by the commissioning of a total of 2,781 MW of new generation capacity in 2020 (SAPP, 2021). Installed generation capacity for all 12 SAPP countries was 80,923 MW with operating capacity of 65,198 MW against a demand and reserve of 55,235 MW resulting in an excess generation capacity of 9,963 MW (SAPP, 2021).

However, a lot needs to be done as up to 2,190 MW in Angola could not be accessed due to lack of transmission interconnections to other SAPP countries (International Development Association, 2021). There are deep concerns that the regional generation and transmission investment projects that are critical to promote integration are not being developed. Integration hinges upon large and complex generation and transmission projects, whose implementation is particularly challenging. Some projects are geographically located in more than one country, as is the case of hydropower projects using water bordered by multiple countries or most often of cross-border transmission projects. Large-size generation projects, although often physically located in one country, make sense only in the context of regional power trade. National governments have generally demonstrated a low level of commitment to regional power projects and have tended to retain authority for design and investment decisions within their own boundaries. This is especially the case of generation. Perceptions around political instability and tensions between neighbouring states have exacerbated the problem. A total of 10,040 MW generation capacity is planned to be commissioned in the SAPP region within the next 3 years between 2021 and 2023 of which a total of 1,867 MW is planned to be commissioned in 2021 (SAPP, 2021). The SAPP has commissioned a total of 22,907 MW of new generation capacity in the past 10 years from 2010 to 2020 (SAPP, 2021). In the last eight

years, SAPP has commissioned the following transmission lines: • The 400kV Matimba-Insukamini Interconnector linking Eskom of South Africa and ZESA of Zimbabwe in 1995. BPC Phokoje substation was tapped into the Matimba line to allow for Botswana's tapping into the SAPP grid at 400kV in 1998, the 400kV Interconnector between Mozambique and Zimbabwe was commissioned in 1997 and is being operated at 330kV, the restoration of the 533kV DC lines between Cahora Bassa in Mozambique and Apollo substation in South Africa was completed in 1998, the 400kV line between Aggeneis in South Africa and Kookerboom in Namibia was commissioned in 2001, the 400kV line between Arnot in South Africa and Maputo in Mozambique was commissioned in 2001, the 400kV line between Camden in South Africa via Edwaleni in Swaziland to Maputo in Mozambique in was completed in 2000 (Musaba, Naidoo, & Chikova, 2004).

4.3.3 Establishment of IPPs within the SAPP members

The question sought to establish whether SAPP has created a conducive environment for independent power producers (IPPs) to establish power generation units and participate in the energy supply market by feeding to the national grid.

Data on whether establishment of IPPs is on the rise within the SAPP members is presented in Table 4.1 above. From the above table we can deduce that the majority of the respondents 50 (68%) strongly agree that SAPP has made great strides in creating a conducive environment for the establishment of the independent power producers within the SADC region while only 9 (14%) strongly disagree.

An SA Embassy Energy expect seconded to SAPP supported:

> *IPPS are coming up within the region. He is quoted saying that the environment is encouraging the participation of IPPs, they are indeed coming in even though they are not joining SAPP directly but through utilities like Eskom and Zesa. They generate power and feed to the grid which is operated by the power utilities and have agreements with these utilities. By virtue of them having long term contracts they then become part of SAPP, they are subcontracted by utilities and they are not directly involved in SAPP business.* (Interview with Sa Embassy Energy Expect, 2022).

The results from both questionnaire and interviews indicate that indeed the environment is conducive for the establishment of independent power producers as well as its participation. The results are supported by (Anton, Katharine, Elvira, & Pedro, 2016) , who noted that currently, 126 IPPs are present in 18 countries of Sub-Saharan Africa. Together, they account for more than 13 percent of the subcontinent's total installed generation capacity and 25 percent if South Africa is excluded. This is a notable share of total generation, given that most IPP investment has occurred in just the past few years (Anton, Katharine, Elvira, & Pedro, 2016)

The financing requirements of the power sector far exceed most countries already stretched public finances. Therefore, greater volumes of private investment will be critical to scale up generation capacity and thereby expand and improve electricity supply. While public and utility financing has traditionally been the largest source of investment in power generation, independent power projects (IPPs) are now growing rapidly (Anton, Katharine, Elvira, & Pedro, 2016). They presently constitute the primary vehicle for private investment in the African power sector and most likely will continue to do so for the foreseeable future. However, IPP investments could be much larger and less concentrated. South Africa alone accounts for 62 percent of IPP capacity; most of the remaining projects are located in a handful of countries.

Many more African countries could and should benefit from such investments (Anton, Katharine, Elvira, & Pedro, 2016). Although African governments strive to foster private sector participation, increased private investment will not materialize just because the need is great. Investments will flow where rewards demonstrably outweigh risks, while governments will demand investments that serve the public interest and support poverty reduction and growth targets. Investment and development imperatives are often difficult to balance (Anton, Katharine, Elvira, & Pedro, 2016).

4.3.4: SAPP members and exporting of excess power

The question sought to establish whether SAPP members are exporting excess power to the national grid. Data on whether SAPP members are exporting access power to the national grid is presented in Table 4.1 above. The presentation shows that only 9 (15%) strongly disagree that SAPP members are exporting excess power while 45 (70%) strongly agree that indeed SAPP member export excess power to the grid. A total of USD 91.1 million was exchanged on the market in 2020/21 (SAPP, 2021). SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries (Turkson, 2002).

> *A ZESA official said SAPP has improved the availability of power by catering for the increased demand for power with the region whereby other countries have got excess power which they can wheel and sell at the agreed cost to other member states and Zimbabwe has benefitted a lot from this arrangement and so is other members.* (Interview with Zesa Electrician, 2022).

Results from both interviews and questionaiires show that SAPP has indeed improved availability of power within the region. However, SAPP Activity on the competitive market decreased in 2020/21 where a total of 1,498.55 GWh was traded compared to 2,004.4 GWh

traded in 2019/20. The lockdowns imposed in the countries due to the COVID-19 pandemic led to an overall decline in electricity demand (SAPP, 2021). The residential electricity demand increased, however, the drastic reduction of industrial and commercial businesses, as well as the suspension of a large portion of service sector related activities has more than offset the growth of household consumption. The Day-Ahead Market (DAM) continued to dominate the SAPP competitive electricity market taking 69% of the total energy traded and the remainder was Intra-Day-Market (IDM) 16%, Forward Physical Market – Weekly (FPM-W) 8% and Forward Physical Market – Monthly (FPM-M) 6% (SAPP, 2021).

4.3.5: Implementation of compact fluorescent lamps

The question sought to establish whether the use of fluorescent lamps is being implemented by the member states in order to deal with the demand side of the electricity by minimising wastages and encouraging a culture of saving and to use electricity more efficiently.

Data on whether use of compact fluorescent lamps (CFLs) is being implemented in order to manage the demand side of electricity is presented in Table 4.1 above. The presentation shows that the majority 45 (70%) of respondents were in agreement that use of compact fluorescent lamps (CFLs) is being implemented in order to manage the demand side of electricity. The finding corroborates that of Dube, Chiguvare and Chipumho, (2007) who argue that in an effort to use electricity more efficiently, the SAPP has introduced the use of compact fluorescent lamps (CFLs) in a bid to replace the inefficient incandescent bulbs. In addition, it is estimated that in the SAPP region CFL program achieved savings amounting to approximately 750MW in 2010.

A ZESA official said that

> *CFLs last longer with at least 8 000 hours compared incandescent bulbs which lasts for about 1000 hours. The participants also indicated that the implementation of CFL*

program is part of a wider strategy to supplement the supply side strategies by creating a virtual power station of 4500MW in the SAPP region. In addition, CFL program achieved savings amounting to approximately 750MW in 2010. (Interview with Zesa Manager, 2022).

Another participant interviewed also echoed the same sentiments as the electrician from Zesa is quoted saying that:

Energy savers or compact fluorescent bulbs go a long way in managing the demand side of the electricity usage as that leads to huge savings in power compared to the continued use of the incandescent bulbs which consume a lot of power, the energy saved can create a virtual PowerStation enough to service even a township (Interview with Zesa Electrician, 2022).

An interview with ZESA Manager indicates that CFLs last longer with at least 8 000 hours compared incandescent bulbs which lasts for about 1000 hours. The participants also indicated that the implementation of CFL program is part of a wider strategy to supplement the supply side strategies by creating a virtual power station of 4500MW in the SAPP region.

The results from both interview and questionnaire indicate that SAPP has made great stride on the demand side management by formulating policies that encourage the use of energy savers inorder to reduce energy wasted by incandescent lamps. In addition, CFL program achieved savings amounting to approximately 750MW in 2010. The finding is also supported by Rafemoyo, (2010) who notes that the use of energy saver bulbs will result in the power utility saving about 200MW, doubling the current available capacity of the combined small thermals. In support, Dube, Chiguvare and Chipumho, (2007) also found that SAPP has introduced the use of compact fluorescent lamps (CFLs) in a bid to replace the inefficient incandescent bulbs.

In addition, it is estimated that in the SAPP region CFL program achieved savings amounting to approximately 750MW in 2010.

4.4 SAPP and competitive electricity market in Southern Africa

The second objective of this study was to assess whether SAPP has developed a competitive electricity market in Southern Africa. In order to achieve this objective, respondents were asked a number of questions on whether the energy market has been liberalised, if there is an establishment of a standard market design, and whether there is an increase in the participation of independent power producers and the responses were as follows.

Table 4.2 SAPP and competitive electricity market in Southern Africa (N=64)

Statement	Agree F %	D/A F %	SA F %	SDA F %	No idea F %
SAPP and the national energy market in Southern Africa	10 (16%)	2 (3%)	40 (62.5%)	4 (6%)	8 (12.5%)
SAPP and a standard market design	20 (31%)	2 (3%)	30 (47%)	2 (3%)	10 (16%)
SAPP and the participation of the independent power producers	10 (16%)	2 (3%)	45 (70%)	3 (5%)	4 (6%)
SAPP and development of consistent market mechanism	20 (31%)	5 (8%)	25 (39%)	4 (6%)	10 (16%)
SAPP shaping an efficient and robustly competitive wholesale electricity marketplace	15 (23%)	5 (8%)	30 (47%)	4 (6%)	10 (16%)

4.4.1 SAPP and the national energy market in Southern Africa

The question sought to establish whether SAPP has liberalised the energy markets by removing stumbling blocks that may hamper the hustle free buying and selling of electricity through the energy market. Data on whether the SAPP has liberalized the national energy market shows that the majority 40 (62.5%) of the respondents strongly agree that SAPP has liberalized the

national energy market. For instance, the electricity industry in Zimbabwe was opened to competition in the generation sector in 2002 even though the participation of the independent power producers has been slow as may be reflective of lack of capacity of licensed IPPs to attract finance, high financial costs for IPPs leading to high expected tariffs and difficulties in getting insurance for secured loans by investors (Turkson, 2002).

4.4.2: SAPP and a standard market design

The question seeks to establish whether SAPP has established guidelines governing the sale of electrical power and the operations of electrical transmission lines. Data collected indicate that the majority of respondents 30 (47%) strongly agree that the SAPP has established a standard market design as presented in Table 4.2 above. The SAPP is governed by four agreements: the Inter-Governmental Memorandum of Understanding which enabled the establishment of SAPP; the Inter-Utility Memorandum of Understanding, which established SAPP's basic management and operating principles; the Agreement Between Operating Members which established the specific rules of operation and pricing; and the Operating Guidelines, which provide standards and operating guidelines (SAPP, 2021).

In April 2001, SAPP commenced the Short-Term Energy Market. The Short-Term Energy Market (STEM) designed to be day-ahead, compliments the bilateral market and provides another technique for the pricing of electrical energy in SAPP. The goal of standard market design is to establish an efficient and robustly competitive wholesale electricity marketplace for the benefit of consumers. This could be done through the development of consistent market mechanisms and efficient price signals for the procurement and reliable transmission of electricity combined with the assurance of fair and open access to the transmission system (Musaba, Naidoo, & Chikova, 2004).

The findings corroborate SAPP report that the SAPP regional market platform started in 2001 with the Short-Term Energy Market (STEM) (SAPP, 2021). It was noted that the Short-Term Energy Market (STEM) designed to be day-ahead, compliments the bilateral market and provides another technique for the pricing of electrical energy in SAPP. The finding also corroborates that of Turkson, (2002) who argues that the goal of standard market design is to establish an efficient and robustly competitive wholesale electricity marketplace for the benefit of consumers.

4.4.3: SAPP and the participation of the independent power producers

The question sought to establish whether SAPP has increased participation of independent power producers by creating a conducive environment for independent power producers (IPPs) to participate power generation and in the energy supply market. Data on whether the SAPP has increased participation of the independent power producers is presented in Table 4.2 above. Data collected shows that 45 (70%) of respondents agree that SAPP has increased participation of the independent power producers while only a small portion 3 (5%) of the respondent said SAPP hasn't done enough to attract participation of independent power producers. The increased participation is evidenced by 126 IPPs who are now present in 18 countries of Sub-Saharan Africa accounting for more than 13 percent of the subcontinent's total installed generation capacity and 25 percent if South Africa is excluded (SAPP, 2021). This is a notable share of total generation, given that most IPP investment has occurred in just the past few years (Anton, Katharine, Elvira, & Pedro, 2016) .

4.4.4: SAPP and development of consistent market mechanism

The question sought to establish whether SAPP has developed a consistent market mechanism for the trading of electricity within member states. Data on whether the SAPP has developed a consistent market mechanism as presented in Table 4.2 above show that a whopping 25 (39%) of respondents agree that SAPP developed a consistent market mechanism.

The consistent market mechanism allows the market to move to an equilibrium point and distributes resources efficiently. The market mechanism has some advantages such as allocative efficiency, signals investment, and little or no government intervention. In this case SAPP determines how, when and where electricity trading can happen. This is enabled by the fact that the SAPP has a sound governance structure, with its key establishing agreements and operating guidelines signed by both members' governments and utilities. The governance structure is also robust and clear on the functions of the various SAPP bodies. In 2002, a Coordination Center was established in Harare, Zimbabwe as an arm of the Operating Subcommittee to monitor operations and transactions within the Pool, including controlling dispatching operations and serving as trading center for electricity auctions. The Coordination Center is the first body with responsibility for regional power market oversight and operation established in Africa (International Development Association, 2021).

4.4.5: SAPP shaping an efficient and robustly competitive wholesale electricity marketplace.

The question sought to establish whether SAPP has shaped an efficient and robustly competitive wholesale electricity marketplace. Data as presented in Table 4.2 above show that 30 (47%) of respondents agree that SAPP has shaped a an efficient and robustly competitive wholesale electricity marketplace. This was also corroborated by the interview conducted with the SAPP staffer as per interview translation below.

> *A SAPP staff member when asked whether SAPP has shaped an efficient and robustly competitive energy market place said that you should know what happens with market issues, it's the same as what happens when you go to the market to buy vegetables, if you have 10 people selling the same product, same quality, it's the same with power, because we are connected to the same grid and basically the quality of power is the same so what then determines the competitiveness of the tariff is the availability of the people or maybe companies, generating stations who are selling their power so definitely there's that competitiveness within the market.* (Interview with SAPP Staff member, 2022).

Based on intergovernmental agreements, the general trading arrangement in SAPP is for the national utilities to engage into long term bilateral contracts for the sourcing and consumption of electrical energy. The intergovernmental agreements and the bilateral contracts form the foundation for cross border electrical energy trading. The routine activities that follow include scheduling, settlements and the monitoring of quality of supply. Further on, based on events, detailed investigations are conducted into inadvertent energy flows and major power system faults and disturbances. For the bi-lateral contracts, the pricing of electrical energy is negotiated and the outcome is generally based on the classical economics of supply and demand. At times of peak consumption, the price for electrical energy is generally higher and lower during off-peak times. Comparison of the difference in rates for peak and off-peak consumption for four countries in the Southern Africa market is given in Table-2. The off-peak tariff in most countries is approximately 40% of the peak tariff. This difference promotes new business opportunities. Hence, we introduce a new process for pricing of electrical energy in the short term (Musaba, Naidoo, & Chikova, 2004).

4.5 SAPP and the coordination of electricity trade relations among SADC countries

The third objective of this study was to evaluate the extent to which SAPP has coordinated electricity trade in within the Southern African countries. In order to achieve this objective, respondents were asked whether the SAPP has enhanced regional integration and whether the SAPP has improved trade relations within Southern African countries.

Table 4.3 SAPP and the coordination of electricity trade relations among SADC countries (N=64)

Statement	Agree F %	D/A F %	SA F %	SDA F %	No idea F %
SAPP and regional integration	20 (31%)	5 (8%)	30 (47%)	4 (6%)	5 (8%)
SAPP and trade relations in Southern Africa	20 (31%)	5 (8%)	30 (47%)	4 (6%)	10 (16%)
SAPP encouraged the import and export of electricity from regional peers	10 (16%)	2 (3%)	45 (70%)	3 (5%)	4 (6%)
SAPP creating a regional network, market to trade and transfer electrical power	20 (31%)	2 (3%)	30 (47%)	2 (3%)	10 (16%)
Importation of electricity from regional peers has become easy and simplified for SAPP member countries	10 (16%)	2 (3%)	45 (70%)	3 (5%)	4 (6%)

4.5.1: SAPP and regional integration

The question sought to establish whether SAPP has enhanced regional integration. Data on whether the SAPP has enhanced regional integration is presented in Table 4.3 above. The presentation shows that 30 (47%) agree that SAPP has enhanced regional integration and its formation is already a symbol of regional integration. Regional integration helps countries overcome divisions that impede the flow of goods, services, capital, people and ideas. These divisions are a constraint to economic growth, especially in developing countries. The findings corroborate that of Turkson, (2002) who noted that SAPP has improved Zimbabwe relations

with other countries in that it has facilitated cross-border power trading. This trading allows Zimbabwe to buy and sell electricity through an existing network of transmission lines and relay substations**.**

> *A Ministry of Energy and Power Development, Energy Specialist said that the SAPP has improved regional integration and trade relations within the region as Countries come together and have meetings from time to time through the SAPP platform to discuss about power shortages in country A, country B and also discuss on ways improve power and mitigating these shortages and how available power can be shared. Countries with excess power will want to make an extra dollar by selling power.* (Interview with Min of Energy Engineer, 2022).

From the interview with the Min of Energy and Power Development Engineer we can deduce that majority of respondents echoed the same sentiments that SAPP has enhanced regional integration and its formation has helped countries overcome divisions that impede the flow of goods, services, capital, people and ideas.

4.5.2: SAPP and trade relations in Southern Africa

The question sought to establish whether SAPP has improved trade relations within Southern Africa**.** Data on whether the SAPP has improved trade relations within Southern African countries is presented in Table 4.3 above. The presentation shows that 30 (47%) agree while 4 (6%) strongly disagree that the SAPP has improved trade relations within Southern African countries. Liberals believe that international institutions play an important role in interdependence-based cooperation among states (Shiraev, 2014). SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries (Turkson, 2002). The aim is to provide an integrated power transmission grid and energy market across countries that can create and exploit economies of scale in the generation,

transmission and distribution of electric power (Woolfrey, 2016). This permits positive spillover effects across the different regions with benefits that are greater than those that could be generated by individual governments acting alone (Andrews-Speed, 2011).

SAPP helped Zimbabwe to better manage its electricity deficit by accessing more than one supplier, and importing electricity at a lower cost than producing it themselves (Turkson, 2002). The limited size of their domestic power markets indeed offered limited opportunities for economies of scale in electricity production (World Bank, 2007; Castalia, 2009).

4.5.3: SAPP encouraged the import and export of electricity from regional peers

The question sought to establish whether SAPP encouraged the import and export of electricity from regional peers. Data illustrated from table 4.3 above shows that the majority 45 (70%) of the respondents strongly agree that SAPP has indeed encouraged the import and export of electricity from regional peers.

The participants strongly agree that SAPP members are exporting access power to the national grid and this is corroborated by (SAPP, 2021) which indicated that a total of USD 91.1 million was exchanged on the market in 2020/21 and USD 145.8 million exchanged in 2019/20. SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries (Turkson, 2002). A total of 1,498.55 GWh was traded in 2020/21 period as well as 2,004.4 GWh traded in 2019/20 (SAPP, 2021). The aim is to provide an integrated power transmission grid and energy market across countries that can create and exploit economies of scale in the generation, transmission and distribution of electric power (Woolfrey, 2016).

4.5.4: SAPP creating a regional network, market to trade and transfer electrical power

The question sought to establish whether SAPP creating a regional network, market to trade and transfer electrical power. Data on whether the SAPP creating a regional network, market to trade and transfer electrical power shows that the majority 30 (47%) of the respondents strongly agree that SAPP has created a regional network, market to trade and transfer electrical power.

This has enabled Zimbabwe to import electricity from regional peers, South Africa and Mozambique, as well as generally through the Southern African Power Pool (SAPP), a grouping of the region's major power stations. SAPP has improved Zimbabwe relations with other countries in that it has facilitated cross-border power trading. Trading allows Zimbabwe to buy and sell electricity through an existing network of transmission lines and relay substations (Turkson, 2002). This enables the exchange of power from those countries that have energy surpluses. To ensure all countries benefit from this initiative, the SAPP has resolved to fast track the implementation of priority regional transmission projects in order to connect the three remaining countries to the regional grid.

4.5.5: Importation of electricity from regional peers has become easy and simplified for SAPP member countries

The question sought to establish whether Importation of electricity from regional peers has become easy and simplified for SAPP member countries. Data on table 4.3 shows that the majority 45 (70%) of the respondents strongly agree that SAPP has liberalized the national energy market.

A total of USD 91.1 million was exchanged on the market in 2020/21 and USD 145.8 million exchanged in 2019/20. SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries (Turkson, 2002). A total of 1,498.55 GWh was traded in 2020/21 period as well as 2,004.4 GWh traded in 2019/20 (SAPP, 2021). Electricity producers get access to larger markets, and can avoid excessive grid losses by selling to customers close to where electricity is produced. Zimbabwe since it has an electricity deficit or limited generation potential is accessing reliable electricity from outside their borders.

4.6 Challenges faced by SAPP in alleviating electricity problem in Southern Africa

The fourth objective of this study was to establish the challenges faced by SAPP in alleviating electricity problem in Southern African countries. In order to achieve this objective, respondents were asked if electricity projects are capital intensive and whether aged and obsolete equipment and poor state of infrastructure is a serious challenge faced by SAPP.

Table 4.4 Challenges faced by SAPP in alleviating electricity problem in Southern Africa (N=64)

Statement	Agree F %	D/A F %	SA F %	SDA F %	No idea F %
Electricity projects are capital intensive	22 (34%)	3 (5%)	32 (50%)	2 (3%)	5 (8%)
Interconnections come at a cost	15 (23%)	4 (6%)	40 (63%)	5 (8%)	0 (0%)
Aged, obsolete equipment and poor state of infrastructure	20 (31%)	3 (5%)	30 (47%)	6 (9%)	5 (8%)
Vandalism of the power network infrastructure	20 (31%)	5 (8%)	25 (39%)	4 (6%)	10 (16%)
Skills shortages especially in professional and technical grades	15 (23%)	5 (8%)	30 (47%)	4 (6%)	10 (16%)

4.6.1: Electricity projects are capital intensive

The electricity industry in Zimbabwe was opened to competition in the generation sector in 2002 even though the participation of the independent power producers has been slow as may be reflective of lack of capacity of licensed IPPs to attract finance, high financial costs. The question seeks to establish whether electricity projects are capital intensive. Data on whether electricity projects are capital intensive is presented in Table 4.11 above and data presented show that 32 (50%) strongly agree that electricity projects are capital intensive projects. The findings corroborate that of Beta (2016) who argues that electricity projects are capital intensive projects and long term, requiring huge capital investment as well as long term commitment. Thus, electrification in Zimbabwe is also far from complete, which further complicates the incentives to go regional since financing plays an important role in the infrastructure development in African power pool regions. An Engineer from the Ministry of Energy and power development in interview said that:

> *Interconnections come at a cost that is not invested in the generation of additional electricity. They also further noted that building interconnections also brings additional costs for utilities and other energy producers as generators need to be adjusted to accommodate utilities elsewhere on the regional grid* (Interview: Ministry of Energy and power development Engineer, 2022).

4.6.2: Interconnections come at a cost

Interconnections come at a cost that is not invested in the generation of additional electricity (Beta, 2016). Data on whether Interconnections come at a cost in table 4.4 also corroborate vies by (Beta, 2016) that indeed interconnections come at a cost as the majority of respondents 40 (63%) strongly agree. Building interconnections also brings additional costs for utilities and

other energy producers as generators need to be adjusted to accommodate utilities elsewhere on the regional grid (Kayo, 2001). Unless there is a mechanism to compensate countries that bear additional cost in adjusting their distribution capacity to include other utilities, there may be limited short-term motivation to incur such costs (Rafemoyo, 2010). Countries often favour the construction of new infrastructure projects, over maintaining existing ones, which is explained by their different nature as regional public goods (Andrews-Speed, 2011).

4.6.3: Aged, obsolete equipment and poor state of infrastructure

The respondents noted there was a challenge of aged and obsolete equipment and poor state of infrastructure facing SAPP. Majority of respondents 30 (47%) strongly agree that aged obsolete equipment and poor state of infrastructure is a major setback to SAPP in carrying out its mandate. The findings also corroborate that of Rafemoyo, (2010) who argues that there is a challenge of an aged and obsolete equipment and poor state of infrastructure as well as vandalism of the power network infrastructure hamper the efficient generation and distribution of electricity. There is also lack of adequate working capital to support Hwange Power Station refurbishments and small thermals to unlock their full generation potential. Small thermals are expensive to run at an average cost of US13c/kWh, compared to about US5.6c/kWh for Hwange Power Station (Turkson, 2002).

4.6.4: Vandalism of the power network infrastructure

Power supply is greatly being compromised by increasing cases of theft and vandalism of electricity infrastructure that has resulted in unplanned electricity outages. Theft and vandalism of electrical infrastructure has resulted in increased faults leading to frequent and long power outages that some clients perceive to be load shedding. Data on whether Vandalism of the power network infrastructure shows that the majority 25 (39%) of the respondents strongly

agree Vandalism is a biggest hinderance towards SAPP fulfilling its mandate. The Zimbabwe Electricity and Transmission Distribution Company (ZETDC) lost equipment worth US$300 000 to vandalism in the southern region alone in 2021. In a statement ZETDC southern region acting general manager Gibson Kasipo said:

> *"Vandalism of electricity infrastructure is crippling implementation of new projects in the region as available funding is being channelled towards replacing vandalised equipment. "At the moment vandalism and theft of ZESA equipment is on the increase*," *"From January 2021 to November 2021, we have lost over 30 transformers valued at US$230 980. The vandals are targeting transformer oil and coils." In total region lost US$284 000. "During the same period, we have also lost about 2206kgs of overhead copper conductor valued at US$44 130 and 1 180 meters of underground copper cables valued at US$9 246. In total we have lost US$284 356 from vandalism of ZESA infrastructure in ZETDC Southern Region only for the period under review,"* he said.
>
> Consequently, Kasipo said, *vandalism is greatly compromising power supply.*
>
> *"Power supply is greatly being compromised by increasing cases of theft and vandalism of electricity infrastructure that has resulted in unplanned electricity outages. Theft and vandalism of electrical infrastructure has resulted in increased faults leading to frequent and long power outages that some clients perceive to be load shedding,"* he said (Staff Reporter, 2021).

Vandalism of the power network infrastructure hamper the efficient generation and distribution of electricity.

4.6.5: Skills shortages especially in professional and technical grades

The socio-economic development of a country hinges on the availability of skilled human resources to drive its growth. Brain drain has long been a challenge for South Africa as the country continues to lose skilled professionals to other countries, hence, the unsteady growth of its economy. The power utility is also not spared by skills shortages especially in professional and technical grades due to human capital flight in search of greener pastures.

Data on whether Skills shortages especially in professional and technical grades has affected the SAPP members to fully participate and execute their mandate in table 4.4 above show that the majority 30 (47%) of the respondents strongly agree that indeed brain drain is a biggest impediment within the energy sector

4.7 Chapter summary

The chapter presented and analysed the data collected from participants. Data was collected using interviews and questionnaires. Narrations were used to present qualitative data and bar charts; tables and pie chats were used to present quantitative data. The next chapter presents the study summary, conclusion and recommendations as well as areas for further research.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

5.1 Introduction

The previous chapter presented data presentation, analysis and interpretation of the research findings on the effectiveness of the southern African Power pool (SAPP) in alleviating electricity shortages in Southern African countries. This chapter gives research summary, conclusions, and recommendations of the study.

5.1 Summary of the whole project

Chapter 1 which is the first chapter for the study basically gave the direction of the research. It gave the introduction to the study on the effectiveness of the southern African Power pool (SAPP) in alleviating electricity shortages in Southern African countries, the background to the study, the statement of the problem as well as the research objectives, and research questions guiding the study. In addition, it also looked at the significance of the study, limitations and delimitations as well as definitions of key operational terms of the study.

In chapter two the researcher reviewed related literature on the effectiveness of the southern African Power pool (SAPP) in alleviating electricity shortages in Southern African countries. The theoretical framework was highlighted as well as the previous related studies.

In Chapter 2 the research methodology was discussed. A pragmatist paradigm was employed and helped the researcher to provide a grounding where the research avoids engaging in issues of insignificance rather than issues of truth and reality and as such is intuitively appealing. It discussed the descriptive and diagnostic research designs. The research instruments used in this

study were: questionnaires and interviews. Research ethics such as informed consent, privacy, deception and confidentiality were also discussed in this study. Data presentation and analysis procedures were also discussed.

In Chapter 4 the researcher presented data collected using the questionnaires and interviews. The researcher analysed and interpreted the research findings on the effectiveness of the southern African Power pool (SAPP) in alleviating electricity shortages in Southern African countries. Tables, pie charts and narrations were used to present data.

5.2 Summary of Findings

The first objective was to assess whether SAPP has improved the availability of electricity in the Southern African countries. The results indicated that SAPP has improved the availability of electricity in the Southern African countries. This is evidenced SAPP carries out maintenance of existing infrastructure expanding the key infrastructure; establishing IPPs within the SAPP member countries.

The second objective was whether SAPP facilitate the development of a competitive electricity market in Southern African countries. The results indicated that SAPP is facilitating the development of a competitive electricity market in Southern African countries through the Short-Term Energy Market (STEM) (Vanheukelom and Bertelsmann-Scott, 2016). The Short-Term Energy Market (STEM) designed to be day-ahead, compliments the bilateral market and provides another technique for the pricing of electrical energy in SAPP. In addition, the electricity industry in Zimbabwe has been opened to competition in the generation supply sector with Transmission, Distribution and Supply retaining monopoly for now.

The third objective was to assess whether SAPP facilitates the coordination of electricity trade

in southern African countries. The results indicate that SAPP has enhanced regional integration in the development of technical infrastructure. This is so because notable progress has been made in developing the regional electricity infrastructure since the creation of the SAPP in 1995, from the transmission networks to the trading platforms. By creating a regional power market, regional energy cooperation in theory allows countries to: better connect supply and demand for electricity by expanding the geographic scope of energy markets; optimise the use of regional generating resources and improve the reliability and affordability of electricity in Sub-Saharan Africa; increase the economic efficiency of the electricity sector through competition effects from different suppliers; attract investors to the energy sector through opportunities to benefit from economies of scale and address social equity, through affordable energy from modern energy infrastructure.

The fourth objective was to assess the challenges faced by SAPP. The results indicate that financing for the electricity sector is a challenge due to the long-term nature of the projects. Thus, electrification in Zimbabwe is also far from complete, which further complicates the incentives to go regional. Financing plays an important role in the infrastructure development in African power pool regions. This view is also shared by Dube, Chiguvare and Chipumho, (2007) who argue that SAPP face challenges to finance the construction of new power stations since the power utility ZESA has no financial capacity to fund these huge capital projects on their own.

It was also noted that interconnections come at a cost that is not invested in the generation of additional electricity. This is the case in Zimbabwe where lack of meaningful investment in additional generation capacity and charging of a suboptimal tariff have been compounded by maintenance deficiencies in existing plants, transmission system losses and the rising demand

of on average 3% per annum. In addition, there is a challenge of an aged and obsolete equipment and poor state of infrastructure as well as vandalism of the power network infrastructure hamper the efficient generation and distribution of electricity.

5.3 Conclusions

SAPP has improved the availability of electricity in the Southern African countries. This clearly shows that SAPP has been effective as SAPP has created a regional network and market to trade and transfer electrical power between utilities in Southern African countries. In addition, member countries are now able to use compact fluorescent lamps (CFLs) in a bid to replace the inefficient incandescent bulbs. In addition, the SAPP has facilitated the development of competitive electricity market in southern Africa. This has been effective in alleviating the power shortages within the Southern African region.

SAPP has successfully coordinated electricity trade relations among SADC countries has enhanced the effectiveness of SAPP in alleviating power shortages within the Southern African region to a greater extent. This has enhanced regional integration and has improved trade relations within Southern African countries. The findings corroborate that of Turkson, (2002) who noted that SAPP has improved Zimbabwe relations with other countries in that it has facilitated cross-border power trading. This trading allows Zimbabwe to buy and sell electricity through an existing network of transmission lines and relay substations.

Despite the milestones that have been made by SAPP in alleviating power crisis in Southern Africa, SAPP has faced a plethora of challenges in carrying out its mandate. It can be concluded that electricity projects were capital intensive since interconnections come at a cost that is not invested in the generation of additional electricity. In addition, building interconnections also

brings additional costs for utilities and other energy producers as generators need to be adjusted to accommodate utilities elsewhere on the regional grid. The findings corroborate that of Beta, (2016) who argues that countries often favour the construction of new infrastructure projects, over maintaining existing ones, which is explained by their different nature as regional public goods (Andrews-Speed, 2011).

Overall, the findings for the study show that indeed the SAPP has been very effective in the fight against the power shortages though a lot needs to be done to fully close the energy deficit gap. More needs to be done in the expansion of infrastructure as well as maintenance of existing infrastructure. Refurbishment and replacement of old and obsolete equipment needs to be done as a matter of urgency. Rafemoyo (2010), argued that there is a challenge of an aged and obsolete equipment and poor state of infrastructure as well as vandalism of the power network infrastructure hamper the efficient generation and distribution of electricity.

5.4 Recommendations

a. To alleviate the availability of electricity there is need for SAPP to provide more funds on maintenance of the existing and new infrastructure.

b. To improve power generation SAPP member states must invest heavily in infrastructure development and maintenance.

c. To enhance electricity availability SAPP must fulfil its objectives in order to achieve the intended goal of alleviating electricity shortages in Southern African Countries. In addition, d. SAPP must source funding and investment for capital intensive projects, most member states like Zimbabwe are not bankable and cannot easily get lines of credit but can benefit from loans extended to SAPP for projects since it has membership.

5.5 Further Research Studies

The researcher recommends further research on the following:

The present research is limited in its scope hence to conduct another study to look at the achievements of SAPP.

References

Anton, E., Katharine, G., Elvira, M., & Pedro, A. (2016). Independent Power Projects. Washington: International Bank for Reconstruction and Development / The World Bank.

Beta, A. (2016). The Southern African Power Pool: SAPP Promoting a regional electricity market. Presentation at AFUR Workshop on Emerging Electricity Markets. 6-8 December 2016.

Brenton, P. & Hoffman, B. (eds.). 2013. Political Economy of Regional Integration in Sub-Saharan Africa. World Bank.

Charmaz, K. (2014). Constructing Grounded Theory. (2nd. ed.). Los Angeles, CA: SAGE.

Creswell J. W. (2013) Qualitative Inquiry and Research Design: Choosing Among Five Approaches (3rd ed.), London, England: SAGE.

Creswell, J. W., and Clark, V. L. (2011) Designing and conducting mixed methods research (2nd ed.). London: SAGE Publication.

Collins, H. (2010) "Creative Research: The Theory and Practice of Research for the Creative Industries" AVA Publication.

Dube I, Chiguvare Z and Chipumho E (2007), Zimbabwe Integrated Energy Study, ZEPARU Working Paper Series

ICA. 2011. Regional power status in African Power Pools report. The Infrastructure Consortium for Africa Secretariat c/o African Development Bank.

International Development Association. (2021). PROGRAM FOR ACCELERATING TRANSFORMATIONAL ENERGY PROJECTS. The World Bank.Kaseke, N (2010), The Cost of Power Outages in Zimbabwe's Mining Sector, The African Executive, Issues 277

Musaba, D. L., Naidoo, P., & Chikova, W. B. (2004). Developing a competitive market for regional electricity crossborder trading: The case for the Southern African Power Pool. Harare: SAPP.

Rafemoyo, B (2010), Investments and Outlook for Zimbabwe's Power Sector in: Generation, Transmission and Distribution, Presentation at Zimbabwe Mining Indaba 15 to 17th July 2021.

Kayo, D., (2001), 'Power Sector Reform in Zimbabwe', proceedings of a regional policy seminar on power reforms in Africa, African Energy Policy Research Network, Nairobi.

Turkson, J. K., (2002), Power Sector Reforms in Sub-Saharan Africa, Macmillan, London.

Rafemoyo, B (2010), Investments and Outlook for Zimbabwe's Power Sector in: Generation, Transmission and Distribution, Presentation at Zimbabwe Mining Indaba 15 to 17th September 2010

SAPP. (2021). 2021 Anual Report. Harare: Southern Africa Power Pool.

Southern African Development Community(SADC) (2012).MEMBER STATES [Internet]. Available from:http://www.sadc.int/member-states/Hammons, TJ.

Southern African Power Pool (1995).Southern AfricanPower Pool Agreement between OperatingMembers [Internet]. 1995. Available from:www.sapp.co.zw

UNCTAD.(2017). The least developed countries report 2017: Transformational energy access.

UNECA.(2004). Assessment of Power Pooling Arrangement in Africa.UNECA Sustainable Development Division.

Saunders, M., Lewis, P. & Thornhill, A. (2012) "Research Methods for Business Students" 6th edition, Pearson Education Limited.

ZESA website www.zesa.co.zw, accessed June 2022

Zikmund, G.W. (2000), Business Research Methods, 6th ed.,The Dryden Press, Harcourt College Publishers, New York.

SAPP. (2021). 2021 Anual Report. Harare: Southern Africa Power Pool.

APPENDICES
APPENDIX A:

SPECIMEN QUESTIONNAIRE FOR ZESA EMPLOYEES, SAPP STAFF, EMBASSY OF THE REPUBLIC OF SOUTH AFRICA, MIN OF ENERGY AND POWER DEVELOPMENT

Dear Respondent

I am a postgraduate student at Bindura University of Science Education (BUSE). As part of my studies, I am required to do a study on a topic of my choice in fulfilment of my Master of Science degree in International Relations and kindly request for your assistance by participating in this study. My research topic is entitled "**The effectiveness of the Southern African Power Pool (SAPP) in alleviating electricity shortages in the Southern African countries: A case study of Zimbabwe and South Africa".**

Please answer the questions below by writing or ticking in the appropriate boxes or space provided. Do not write your name or sign on the questionnaire for confidentiality purpose. The questionnaire is for research purposes only, therefore feel free to express your opinion and be as sincere as you can be.

SECTION A: DEMOGRAPHIC DATA

1. **GENDER**

MALE [ ] [ ]

2. **AGE PROFILE**

BELOW 25 YEARS [ ] 26-30 YEARS [ ] 31-40 YEARS [ ]

41-50 YEARS [ ] ABOVE 50 YEARS [ ]

3. **EDUCATIONAL PROFILE (HIGHEST)**

DIPLOMA [ ] HIGHER DIPLOMA [ ]

FIRST DEGREE [ ] MASTERS DEGREE [ ]

OTHER [ ]

4. WORK EXPERIENCE

1-5 YEARS [ ] 6-10 YEARS [ ]

11-15 YEARS [ ] 16-20 YEARS [ ]

ABOVE 21 YEARS [ ]

5. IN WHICH OF THE FOLLOWING CATEGORY DO YOU FALL IN.

MANAGEMENT	[ ]	ADMINSTRATION	[ ]
ELECTRICIAN	[ ]	ENGINEER	[ ]
NON TECHNICAL	[ ]	SUPPORT STAFF	[ ]

6. IN WHICH OF THE FOLLOWING ORGANISATION DO YOU WORK FOR

SOUTHERN AFRICA POWER POOL	[ ]
EMBASSY OF THE REPUBLIC OF SOUTH AFRICA	[ ]
MINISTRY OF ENERGY AND POWER DEVELOPMENT	[ ]
ZIMBABWE ELECTRICITY SUPPLY AUTHORITY	[ ]
OTHER	[ ]

SECTION B: EMPIRICAL DATA

(i) SAPP enhances electricity availability and efficiency in Southern Africa

Use a LIKERT SCALE ((strongly agree = 5, Agree =4, disagree =3, strongly disagree = 2, no idea = 1)) to answer the following questions:

	5	**4**	**3**	**2**	**1**
4. The SAPP carries out maintenance of the existing infrastructure					
5. Expansion of key infrastructure is growing in Sothern Africa					
6. Establishment of IPPs is on the rise within the SAPP members					
7. SAPP members are exporting excess power to the national grid					
8. Use of compact fluorescent lamps (CFLs) is being implemented in order to manage the demand side of electricity (demand side management)					

.

(ii) SAPP facilitating the development of a competitive electricity market in Southern Africa

Use a LIKERT SCALE (strongly agree = 5, Agree =4, disagree =3, strongly disagree = 2, no idea = 1) to answer the following questions:

	5	4	3	2	1
9. The SAPP has liberalized the national energy market					
10. SAPP established a standard market design					
11. SAPP has increased participation of the independent power producers					
12. SAPP formation has led to a development of consistent market mechanism					
13. The SAPP has shaped an efficient and robustly competitive wholesale electricity marketplace					

(iii) SAPP coordinating electricity trade relations among SADC countries

Use a LIKERT SCALE (strongly agree = 5, Agree =4, disagree =3, strongly disagree = 2, no idea = 1) to answer the following questions:

	5	4	3	2	1
14. SAPP has enhanced regional integration					
15. SAPP improved trade relations within the Southern African countries					
16. SAPP encouraged the importand export of electricity from regional peers					
17. Formation of SAPP is creating a regional network and market to trade and transfer electrical power within the Southern African Region					
18. Importationelectricity from regional peers has become easy and simplified for SAPP member countries					

(iv) The challenges faced by SAPP in alleviating electricity problem in Southern African Countries

Use a LIKERT SCALE (strongly agree = 5, Agree =4, disagree =3, strongly disagree = 2, no idea = 1) to answer the following questions:

	5	4	3	2	1

19. Electricity projects are capital intensive projects
20. Interconnections come at a cost
21. Aged and obsolete equipment and poor state of infrastructure
22. Vandalism of the power network infrastructure hamper
23. Skills shortages especially in professional and technical grades

APPENDIX B:

SPECIMEN INTERVIEW SCRIPT FOR SAPP STAFF; MIN OF ENERGY AND POWER DEVELOPMENT STAFF; ZESA EXECUTIVES; EMBASSY OF THE REPUBLIC OF SOUTH AFRICA STAFF

Main Question: How effective is the Southern African Power Pool in alleviating electricity shortages in Southern Africa?

1. What is your understanding of SAPP?
2. Can you explain to what extent do you think SAPP has improved the availability of electricity in Zimbabwe and South Africa?
   i. Maintaining the existing infrastructure within member countries?
   ii. Do you think SAPP is conducting expansion of existing infrastructure?
   iii. Is there any establishment of IPPs within the SAPP members?
3. In what way do you think SAPP has facilitated the development of a competitive electricity market in Zimbabwe?
   i. Is SAPP liberalizing of the national energy market among the members?
   ii. Is SAPP establishing standard market design and consistent market mechanism among members?
4. Can you further explain how SAPP has enhanced electricity trade relations amongst the SADC countries?
   i. Is SAPP enhancing regional integration?
   ii. Has SAPP improved trade relations within the member countries?
   iii. Encouraging the import and export of electricity from regional peers?
5. Lastly, what do you think could be the challenges faced by SAPP in alleviating electricity problem in Zimbabwe?

THE END

THANK YOU

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ZIMBABWE ELECTRICITY TRANSMISSION & DISTRIBUTION COMPANY

From: Moyo Success **At:** Chitungwiza

To : The General Manager **At:** Harare Region

Date: 20 October 2022 **Ref:** 115/1/SM/sm

SUBJECT: REQUEST TO CARRY OUT A RESEARCH IN THE ORGANISATION

Reference is made to the above.

I am a final year postgraduate student at Bindura University of Science Education (BUSE). As part of my studies, I am required to do a study on a topic of choice in partial fulfilment of my Master of Science degree in International Relations. My research topic is entitled **"The effectiveness of the Southern African Power Pool (SAPP) in alleviating electricity shortages in the Southern African countries: A case study of Zimbabwe and South Africa"**. As this process requires evidence of research in the cited case, I am therefore requesting your authority to carry out a survey and interviews with relevant officers to enable me to collect the information. The information gathered is purely for academic purposes and shall not be used anywhere else other than for the purpose it was sort for. I will be grateful if my request is granted. I look forward to your favourable consideration.

Moyo Success ZE292265
Commissionaire ZETDC Chitungwiza District

Cell: +263 782124965/ 716152328
Email: smoyo@zetdc.co.zw

Recommended/ ~~Not recommended~~: .....
General Manager

Approved/ Not Approved: .....
Managing Director

cc File

ZETDC - MSD OF ...
INCOMING ...
DATE RECEIVED 02/11/2022
ACTIONED BY: .....

DEPARTMENT OF PEACE AND GOVERNANCE

P. Bag 1020
BINDURA, Zimbabwe

Tel: 263 - 71 – 7531-6, 7621-4

Fax: 263 – 71 – 7534

0772 596 562

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date 06 OCTOBER 2022

TO WHOM IT MAY CONCERN

RE : REQUEST TO UNDER TAKE RESEARCH PROJECT IN YOUR AREA

This serves to introduce the bearer..... Moyo Success .....who is a **MASTER OF SCIENCE DEGREE IN INTERNATIONAL RELATIONS** student at Bindura University of Science Education and is carrying out a research project in your area.

Your usual co-operation and assistance is therefore being sought.

Thank you for the continued support.

Yours faithfully

BINDURA UNIVERSITY OF SCIENCE EDUCATION
PEACE & GOVERNANCE
CHAIRPERSON
30 SEP 2022
FACULTY OF SCIENCE EDUCATION
PRIVATE BAG 1020, BINDURA, ZIMBABWE

PP. Dr D. Makwerere
Chairperson Department of Peace and Governance