Pan African University
Institute of Water and Energy Sciences

جامعة أبو بكر بلقايد
UNIVERSITÉ DE TLEMCEN

PAN-AFRICAN UNIVERSITY

INSTITUTE OF WATER AND ENERGY SCIENCES

(Including CLIMATE CHANGE)

Master Dissertation

Submitted in partial fulfillment of the requirements for the Master degree in

ENERGY POLICY

Presented by

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Energy democracy and Germany's transition to renewable energy: What can Zimbabwe learn to end its electricity power woes?

Defended on …. Before the Following Committee:

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PAN-AFRICAN UNIVERSITY

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Energy democracy and Germany's transition to renewable energy: What can Zimbabwe learn to end its electricity power woes?

A thesis submitted to the Pan African University Institute of Water and Energy Sciences (including Climate Change) in partial fulfillment of the requirements for the degree of Master of Science in Energy (Policy option).

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September 2020, Tlemcen, Algeria.

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I dedicate this work to anyone who made this research a success.

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BIOGRAPHICAL SKETCH

Shingirayi Kondongwe a young policy specialist, researcher and innovator with a strong passion for enhancing sustainable development. He graduated with a BSc. In Politics and Public Management from the Midlands State University in Zimbabwe, November 2016. After graduation, he joined Nedbank as a junior specialist in Internet Banking before he was awarded an African Union SCHOLARSHIP to study Energy Policy at PAUWES. During his time at PAUWES, he proved to be very ambitious and entrepreneurial judging from his activities. He managed to win the 2019 Tony Elumelu Foundation Entrepreneurship Competition, qualified for the Ignite Africa Challenge Semi-finals and Young Social Enterprises. He was also a member of the PAUWES Entrepreneurship Club. Entrepreneurship is what motivates him and is guided by the following motto, “Pursue a cause, pursue a vision and you will find happiness”.

ACKNOWLEDGMENT

I would like to express my gratitude to the African Union Commission and other partners that included GIZ, Germany's Federal Ministry of Economic Cooperation and Development (BMZ) just to name a few, for granting me this once-in a lifetime opportunity that will open many doors for me. I also wish to extend my gratitude to the Government of Algeria for its peaceful welcoming environment for international students.

I am also grateful to my sole supervisor, Prof Dr. Kosta Mathey for his thoughtful insights towards the completion of this Thesis. I have learned a lot from his expertise and humility. I also want to thank all the Professors who took taught me throughout my beautiful journey at PAUWES.

Lastly, my heartfelt appreciation extends to the entire PAUWES family including the administration and staffs, the professors as well as all the 5th cohort students, particularly my classmates in energy engineering track.

ABBREVIATIONS AND ACRONYMS

BEE	German Renewable Energy Federation
BMWi	Federal Ministry for Economic Affairs and Energy
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IPPs	Independent Power Producers
KFW	Kreditanstalt für Wiederaufbau
MENA	Middle East and North Africa
MEPD	Ministry of Energy and Power Development
MW	Megawatt
REAZ	Renewable Energy Technologies in Zimbabwe
SPSS	Statistical Package for Social Sciences
ZENT	ZESA Enterprises (Pvt) Ltd
ZERA	Zimbabwe Energy Regulatory Authority
ZESA	Zimbabwe Electricity Supply Authority
ZETDC	Zimbabwe Electricity Transmission and Distribution Company
ZPC	Zimbabwe Power Company

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ABSTRACT

The research was conducted in collaboration with the Zimbabwe Power Company in Harare and Bulawayo. The major objective of the research was to contribute to resolve the electricity energy crises in Zimbabwe. Another objective of the research was to extract factors militating against renewable energy progression in Zimbabwe. Zimbabwe is facing its most severe power crisis in decades despite having the potential to generate enough renewable energy to meet its demands and even export surplus. The idea was also to develop policy recommendations and methodologies that will enable Zimbabwe to realize its renewable energy potential. Zimbabwe is characterized with high dependence on fossil fuels for its energy requirements proved costly to the Zimbabwean economy and its development priorities, yet the country is blessed with abundant renewables with a great potential if tapped. Data gathering was done using self-administered questionnaires and analysis of existing relevant documents concerning the topic in question. The population of the study consisted of principal managers/managers and directors employed within Zimbabwe Power Company. From this target population, a sample of 53 participants was drawn and out of these, 50 responded, yielding a response rate of 94%. 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 Germany's model is applicable based on the conditions that Zimbabwe improve its business climate and stamp out corruption. 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 government. The research also established that, the concept of energy democracy is possible to implement. On the technical part, the findings indicated that solar is the best among the sustainable technical solutions required to improve Zimbabwe's electricity problems. The Hybrid grid system was found to be among the most suitable. The information from the research led to the following recommendations: Zimbabwe should improve its business climate; Policy consistency on the part of the government; A sovereign wealth fund must be created to cater for new renewable energy projects; Power generation should be decentralized just to name a few.

Keywords: Energy Democracy, Renewable Energy, Electricity Power.

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Zimbabwe is facing its most severe power crisis in decades despite having the potential to generate enough renewable energy to meet its demands and even export surplus. According to *The Standard* (2019) Zimbabwe has five power stations, which have a combined generating capacity of 2 400MW. As of January 2020, Zimbabwe was generating less than 820 megawatts (MW) from three power stations against a daily peak demand of 1 600MW in winter and 1 400MW in summer (*The Zimbabwe Independent*, 2019). Years of mismanagement, poor planning, underinvestment and corruption in tenders to upgrade aging power stations or develop alternative renewable energy sources have taken the country back to a familiar problem. *The Zimbabwe Independent* (2019) reported that high dependence on fossil fuels for its energy requirements proved costly to the Zimbabwean economy and its development priorities, yet the country is blessed with abundant renewables with a great potential if tapped. In addition, population growth is driving demand for more energy in a country that has little or no meaningful investment in the energy sector since its independence in 1980. Hydropower production is being affected by low-dam water levels at the main Kariba Hydropower plant whilst the old thermal power plants need serious refurbishment to avoid continuous machinery and equipment breakdown. For the past 20 years, Zimbabwe has struggled to generate enough electricity to meet demand, and has had to turn to countries like Democratic Republic of Congo, Namibia, Mozambique, South Africa and Zambia to top up supplies.

With good potential for renewable energy such as solar power, biomass, biofuels (bagasse) small wind and hydropower, one would wonder why Zimbabwe is struggling to produce enough electricity. How did countries such as Germany with even less favourable conditions for renewable energy managed to make use of it? Germany is now producing almost half of its electricity from renewables. In 2018 alone, about 40 percent of Germany's electricity was produced from renewables (*The Independent*, 2019). Several researchers and policy makers believe that the concept of "energy democracy" enabled Germany to a successful transition from fossil fuels to renewables. According to *Morris and Jungjohann* (2016) many consider Germany and its transition to renewable energy a role model of energy democracy. Depending on the agenda or purpose, "energy democracy" may be treated as a model, theory, philosophy, or a case study. For the purpose of this thesis, energy democracy is being employed as a "model" that can be applicable in any scenario.

Energy democracy is an ongoing decentralization of energy systems to encourage local energy ownership through public democratically planned, and community-owned operated renewable energy systems that serve the public interest and deliver tangible community benefits, such as decent and stable employment, public space and transportation, and new public institutions (*Burke and Stephens*, 2018). Energy democracy is an emergent social movement focused on advancing renewable energy transitions by resisting the dominant energy agenda while reclaiming and democratically restructuring energy regimes (*Public Service Department*, 2015) In Germany, communities and private citizens take control over their own energy production and this has been a major driving force behind the rapid uptake of renewable energy. Energy democracy in Germany is being made possible through the “Energiewende". The Energiewende is a major plan for transforming the country’s energy system to make it more efficient and supplied mainly by renewable sources. The *International Energy Agency* (2020) postulated that the Energiewende is clearly visible in electricity generation, where it has increased the share of renewables. Can Zimbabwe replicate Germany in order to arrest its electrical woes? This question represent the focus of this study as is going to be discussed in chapter two.

1.2 STATEMENT OF THE PROBLEM

Zimbabwe, like many African countries, has unlimited access to several renewable sources of energy but these have largely remained untapped (*Murombo*, 2019). Despite of these favourable conditions, Zimbabwe is currently facing serious electricity crisis. Zimbabwe is enduring an unprecedented electricity crisis, which has prompted up to 18 hours a day of so-called load shedding, because the grid cannot generate enough energy to meet national demand or pay for adequate power imports (*Murekedzi*, 2019). Why is Zimbabwe not utilising its renewable energy potential to deal with its electrical woes? Several policy makers in the energy fraternity are of the view that, ageing power plants with obsolete equipment, corruption, monopoly, poor policy implementation, lack of political will just to name a few, are the reasons why Zimbabwe is and had been experiencing electricity shortages in the last two decades. As a result, this study seeks to uncover the factors behind Zimbabwe’s reluctance and inability to utilize its vast renewable energy potential.

1.3 STUDY OBJECTIVE AND QUESTIONS

The purpose of this study is to contribute to resolve the electricity energy crises in Zimbabwe. The expectation is to develop policy recommendations and methodologies that will enable

Zimbabwe to realize its renewable energy potential. Germany's transition model to renewable energy can be used to guide other countries to follow a similar path. Therefore, it is the hypothesis of this study that Zimbabwe can learn from Germany's energy democracy and its Energiewende policy in a bid to improve its electricity woes. The *German Energy Agency* (2020) pointed out that, this is because the international climate goals are ambitious and other countries can benefit from Germany's experience. However, this does not mean to suggest that everything that worked in Germany can also work in Zimbabwe; hence, the researcher's intention is to investigate what can be learned, what can work, what cannot work. If it works, then how best can it be implemented? If it does not work, then what works? The use of the Germany model is intended to help decision-makers and policy experts in selecting appropriate policy measures to create policies for achieving Zimbabwe's renewable energy potential.

The key questions of this study are:

1. What does Energy Democracy mean and what could be the reasons for its relative success in Germany?

2. What are the bottlenecks of transferring this strategy to Zimbabwe?

3. What are the opportunities to overcome those bottlenecks in Zimbabwe?

1.4 STUDY STRUCTURE (STRUCTURE OF THE THESIS)

The study is comprised of five chapters. Chapter one gave the introduction whilst chapter two focused on the literature review and chapter three provided an overview of the methodology and methods used in conducting the research. Chapter four presented on the findings and discussions. Chapter five gave a summary of the study, conclusion and give recommendations to the problem in question. After these chapters, the researcher shall cite the references and appendices.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter seeks to put energy democracy into context in relation to earlier works by other researchers. In addition, key concepts and terms such as "Energieweinde" among others were also highlighted as espoused by a number of scholars and researchers in the field concerning the topic in question. It also identifies gaps in knowledge and explaining why this study is of paramount importance.

2.2 DEFINING ENERGY DEMOCRACY

It is safe to acknowledge that the term energy democracy does not have a single definition. According to *Burke and Stephens* (2017) Energy democracy is an emergent social movement advancing renewable energy transitions by resisting the fossil-fuel-dominant energy agenda while reclaiming and democratically restructuring energy regimes. By integrating technological change with the potential for socioeconomic and political change, the movement links social justice and equity with energy innovation. *Energy-democracy.net* (2020) simply defined energy democracy as a situation whereby people are reclaiming energy distribution and access. From energy access to climate justice and from anti-privatisation to workers' rights, people across the world are taking back power over the energy sector, kicking-back against the rule of the market and reimagining how energy might be produced, distributed and used (Energy-democracy.net, 2020). According to *Center for Social Inclusion* (2020) energy democracy means that community residents are innovators, planners, and decision-makers seeking to use and create energy that is local and renewable.

Even though there are various concepts of Energy Democracy, this study adopts *Camps for Climate Action's* view (2012) that energy democracy smeans ensuring that everyone has access to enough energy. *Szulecki* (2018) postulated that 'Energy democracy' is conceptualized as an analytical and decision-making tool, defined along three dimensions: popular sovereignty, participatory governance and civic ownership, and operationalized with relevant indicators. However, the way that energy is produced, distributed and accessed by the people should not harm nor endanger the environment. It is important to note that energy democracy is a people's movement or activism rather than a governmental master plan.

2.3 GERMANY'S ENERGIEWENDE TO RENEWABLES

2.3.1 Defining Energiewende

Energiewende literally meaning "energy turnaround" or "energy revolution". It refers to Germany's effort to reduce climate-damaging CO_2 emissions, without relying on nuclear energy (*Clean Energy Wire*, 2020). "Energiewende" is simply Germany's transition and transformation from fossil fuels to renewables (*Morris and Jungjohann*, 2016). To break down the term, Energie is self-explanatory whilst *Wende* means U-turn referring to the energy transition that is to take Germany on a new path, but not necessarily back where it came from. Hence, *Wende* is inevitably a turn for the better. The Energiewende is the Germany's planned transition to a low-carbon, nuclear-free economy, however there is much more to it than phasing out nuclear power and expanding renewable energies in the power sector.

2.4 THE LINK BETWEEN ENERGY DEMOCRACY AND GERMANY'S ENERGIEWEINDE

Energy democracy, just like conservatism, liberalism, or socialism can be treated as a political ideology whereas the Energiewende is a series of renewable activities and policies. In other words, energy democracy is a certain set of beliefs and values whilst the Energiewende is a result of those beliefs and values. Here it is a matter of imagination, inspiration and social need that was followed by action. What took place in Germany is what we call ideological influences on governance and regulation. Many academics, experts and scholars who proved that political ideology influence policy decisions (Harrison and Boyd, 2018; Sussman and Daynes, 2010; Entman, 1983) support this.

2.5 HISTORY OF THE ENERGIEWENDE

There is no agreement on the question when the Energiewende started. Many in the energy fraternity believe that the Energiewende kicked off in 2000 with passing of the Renewable Energy Act (EEG). Some analysts argue that the Energiewende began in 2011 as a response to the phasing out of nuclear power in Germany, in reality the Energiewende cannot be pointed to have started at period in time. In 2014, parliamentary state secretary in the economy ministry Uwe Beckmeyer argued that the transition to an energy supply based mostly on renewables was a continuous process, because it was impossible to speak of any "concrete starting date" (Wettengel, 2020). Morris and Jungjohann (2016) also supported this notion by acknowledging that there is no single starting point to Germany's transition.

Table 1: Timeline of Germany's Energiewende

Period	Event/Milestone
1973-1975	**Anti-Nuclear Movement**- protestors block construction of a nuclear power plant in Wyhl, close to Germany's border with France
1979-1980	**Birth of the Green Party**- Enter the Greens Germany's Green Party is founded, with an exit from nuclear energy and a renewable future as key demands Birth of the Term "Energiewende"- Activists and politicians begin to use the term "Energiewende"
1983	**The Green Party enters the Bundestag for the first time.** The term "Bundestag" refers to the German federal parliament.
1986	**Chernobyl Disaster**- even though the accident occurred in Ukraine, it solidifies Germans' resistance to nuclear energy. The same year, the weekly Spiegel magazine publishes a cover story on global warming (climate change), prompting parliament to establish an advisory council to address concerns about climate change.
1990	**Phasing out of GDR's only two nuclear plants**- For economic and security reasons, the GDR's only two nuclear power plants are switched off with the reunification of Germany. First emissions reduction target adopted- Ambitious targets Federal Cabinet adopts its first emissions reduction target: 25 to 30 percent fewer CO_2 emissions by 2005, compared to 1987 levels.
1991	**Feed-in-tariffs**- Kick-starting renewables New legislation introduces feed-in tariffs for renewable power.
1997-2005	**Kyoto Protocol**- New agreement requires Germany - the world's sixth largest emitter at the time -to cut CO2 emissions
2000	**Renewable Energy Act**- The Renewable Energy Act (EEG) stipulates fixed feed-in tariffs and grid priority for renewables. **Nuclear phase-out #1**- Government reaches "nuclear consensus" with utilities: a phase-out by around 2022.
2007	**EU 2020 Climate Targets**- 20 percent of electricity to come from

	renewables; a 20 percent cut in greenhouse gases; 20 percent more

	efficiency. These targets greatly improved Germany's transition to renewables.
2010	**Energy concept**- The government sets out climate and renewables targets for 2020 and 2050. However, there was a drawback when the CDU (conservative) government reverses the "nuclear consensus" by cancelling the phase-out.
2011	**Fukushima disaster-** **Nuclear phase-out #2-** Following the Fukushima disaster, Merkel announces new nuclear phase-out by 2022, with backing of large parliamentary majority.
2014	**A new legal framework of the German energy transition-** Government lowers feed-in tariffs, introduces auction system for PV capacity. **Climate Action Programme 2020-** Government introduces catalogue of measures to reach climate targets.
2015	**Slow progress**- The Energiewende monitoring report shows that climate targets are "in serious danger"; 2020 emission reduction target likely to be "missed considerably". **Paris Agreement**- greatly influenced green transition, not only in Germany but also in every country around the globe.
2016	**Utility spin-offs**- Utilities E.ON and RWE separate renewables from fossil operations **Decarbonisation**- Federal government agrees on its Climate Action Plan 2050, a basic framework for largely decarbonising Germany's economy to reach 2050 climate goals. It includes target corridors for reducing greenhouse gas emissions in individual economic sectors. **Car emissions scandal-** In wake of Dieselgate, German carmakers step up e-mobility ambitions

2017	**Renewables reform-** The switch from set feed-in tariffs to auctions for renewables enters into force. G20 Chancellor Merkel helps close rank of 19 governments in support of Paris Climate Agreement, isolating the US.

	COP23 UN- climate conference in Bonn: delegations negotiate rulebook for Paris Agreement
2018	**New government**- Renewed grand coalition gives up on 2020 climate targets, raises renewables expansion goal, announces Climate Protection Law. **Coal exit commission**- Renewables overtake coal as Germany's most important power source, while government sets up multi-stakeholder task force to decide on country's coal exit path by end of 2018 **Utilities shakeup**- RWE and E .ON split up utility Innogy, separating grids from generation.
2019	**Climate action package**- Climate cabinet presents major policy package including national CO2 price for transport & buildings. **Climate action law**- Germany's first climate law makes emissions reduction legally binding.
2020	**Coal exit law**- Cabinet adopts coal exit law including timetable.

Source: Clean Energy Wire (2020)

2.6 GERMANY'S ELECTRICITY SECTOR SITUATION AND PERFORMANCE SINCE 2000

With over 180GW of installed capacity, Germany is the largest electricity market in Europe. Unlike developing countries in Africa and elsewhere, Germany's electricity situation is solid and reliable. The country does not experience such problems as unplanned blackouts or power cuts. Germany's concerns are mature and honestly seek reduce green-house-gas emissions?", "How can we convince citizens to consume less electricity?" All this this may seem like a fictitious story but it is indeed true.

Since the year 2000, Germany's main ambition was and is to move away from fossil fuel through the Energiewende. Germany has invested over $200 billion in advancing renewable power over the last few decades, primarily wind and solar (Berke, 2018).

However, this does not mean that Germany's source of electricity entirely came from Renewables since the year 2000. Considering that Germany's is a heavy industrious economy, the country also relied on fossil fuels mainly coal and nuclear power to meet both domestic and industrial demands. Though renewables production increased significantly between 2000 and 2020, fossil power production remained at more or less constant levels. Morris and Jungjohann (2016) noted that in the same period nuclear power decreased at the expense of renewables. Over the last decade, the German energy markets have experienced fundamental changes largely driven by the continuous expansion of renewables and the abrupt decision (after the Fukushima accident in 2011) to phase out nuclear power by 2022, which has become one of the cornerstones of Germany's energy market turnaround (Energiewende). Since the year 2000. Germany's Energiewende plan is to phase out Nuclear by 2022.

2.6.1 Where is Germany now regarding renewable energy?

Between 2005 and 2012, Germany increased its share of renewables in final energy consumption from 7% to 12%, and its share of renewables in gross electricity consumption from 10% to 23%. According to Welle (2020), in the first quarter of this year, 52% of electricity came from renewables whilst in the same period last year achieved 44.4%.

2.7 ZIMBABWE'S ELECTRICITY SECTOR: STRUCTURE, POLICY AND REGULATION

2.7.1 Ministry of Energy and Power Development (MEPD)

The Ministry of Energy and Power Development has overall responsibility for energy issues in Zimbabwe. Its mandate includes policy formulation, performance monitoring and regulation of the energy sector as well as research, development and promotion of new and renewable sources of energy. The Ministry supervises and oversees the performance of the energy utility and its subsidiaries (Ministry of Energy and Power Development, 2020).

2.7.2 Zimbabwe Electricity Regulatory Authority (ZERA)

ZERA was established in 2011 under the Energy Regulatory Act [Chapter 13:23]. ZERA's main role is to regulate the procurement,

- production,
- transportation

- transmission,
- distribution,
- importation and
- exportation of energy derived from any energy source.

In short, ZERA's role is to regulate the energy sector as a whole. As outlined in the Energy Regulatory and Licensing authority Act [Chapter 13:23] of 2011, ZERA also serves to,

- Increase Access and Security of Supply;
- Energy Efficiency and the Environmental Protection;
- Market Reform and Competition;
- Research and Development; and
- Key stakeholder Advisory.

2.7.3 Zimbabwe Electricity Supply Authority (ZESA)

The electricity sector is primarily controlled by state-owned enterprise, Zimbabwe Electricity Supply Authority Holdings (ZESA Holdings), which generates, imports and distributes all electricity in the country through its subsidiaries Zimbabwe Power Company (ZPC) and Zimbabwe Electricity Transmission and Distribution Company (ZETDC) (GET.Invest, 2015). The ZPC is mainly responsible for the production of electricity whereas the ZETDC's primary role is for electricity distribution. Besides, ZESA Holdings also control ZESA Enterprises (Pvt) Ltd (ZENT) whose mission is to provide quality electrical products and services. Under the purview of ZESA also include PowerTel Communications which is registered Internet Service provider in Zimbabwe and offers coverage to most parts in the country (Pindula, 2018). The unbundling of ZESA was executed under the Zimbabwe National Energy Policy of 2012. In summation, ZESA's main mission is to delegate tasks to its main subsidiaries, the energy generator Zimbabwe Power Company and the Zimbabwe Electricity Transmission and Distribution Company (GET.Invest, 2015). Plans are also underway to privatize ZESA, however, up to date this has not been implemented.

2.7.4 Zimbabwe Power Company (ZPC)

ZPC is responsible for the production and generation of electricity in Zimbabwe. According to GET.Invest (2015), ZPC became operational in 1999 as an investment vehicle in the generation

of electricity. The organization has been authorized to construct, own, operate and maintain power generation stations for the supply of electricity. ZPC currently controls five power stations, in which four are coal-fired power stations, Hwange, Bulawayo, Munyati and Harare thermal stations and the hydro power station Kariba. All together, they have a total installed capacity of 2,240 MW. Each power station holds a generation license from the Zimbabwe Electricity Regulatory Authority (ZERA, 2020).

2.7.5 Zimbabwe Electricity Transmission and Distribution Company (ZETDC

ZETDC is also a subsidiary of ZESA Holdings. ZETDC is responsible for the transmission of electricity from the power stations, the distribution of electricity as well as its retailing to end users. Its mission is to provide adequate, safe, reliable electricity and related services at competitive prices (GET.Invest, 2015). ZETDC is further divided into two-agencies; the Zimbabwe Electricity Distribution Company is in charge of the distribution and retail of electricity to the end user and the Zimbabwe Electricity Transmission Company balances supply and demand and the transmission of electricity from domestic generation plants.

2.7.6 Rural Electrification Agency (REA) and Rural Electrification Fund (REF)

The Rural Electrification Fund (REF) was established in 2002 and later the Rural Electrification Agency (REA). The government's aim is to bring electricity to rural and remote areas around the country. The government recognizes the fact that rural electrification is a major pillar in enhancing socio-economic development in rural communities. The agency's main focus is to spearhead rapid and equitable electrification of rural areas in Zimbabwe. To date, the rural electrification programme has enabled the electrification of thousands of rural institutions, farms, villages, boreholes, dam points and irrigation schemes (Muponde, 2019).

Table 2: Policy Framework for Electricity Sector

Legislation/Policy	Purpose	Implementing Agency
National Renewable Energy Policy (NREP) and the Biofuels Policy (2020)	It seeks to achieve: • 33% reduction in green house carbon emissions by 2030 • 20% ethanol bleding ratio by 2030	

National Energy Policy (2012)	Policy support and strategic planning for multiple RE sources. The objectives of the Energy Policy are: • to ensure accelerated economic development • to facilitate rural development • to promote small-medium scale enterprises • to ensure environmentally friendly energy development, and • to ensure efficient utilisation of energy resources.	MEPD
Energy Regulatory Act (2011)	The ZERA (Zimbabwe Energy Regulatory Authority) board issues and withdraws licences from all players in the Electricity, Petroleum and Renewable Energy Sectors. It is also responsible for creating a legal framework for fair competition of both private and public players	ZERA
National Electricity Act (2002)	The Electricity Act provided for the establishment of the Zimbabwe Electricity Regulatory Commission(ZERC). ZERC was responsible for licencing operators in the electricity sector, setting of electricity tariff as well as general regulation of the electricity sector to allow for fair competition in the electricity industry. Since the establishment of ZERA in January 2012, all the duties have been transferrred to ZERA and ZERC dissolved.	Formerly ZERC now ZERA
Rural Electrification Act (2002)	The Act allowed for the establishment of the Rural Electrification Fund Board responsible for holding and distribution of Rural Electrification Funds for all rural	REA

	electrification projects countrywide. Allows for the expansion of the national electricity grid to rural government institutions, business centres and chief's homesteads on 100% subsidy and 60% subsidy on other connections. Also provides for decentralised electrication using renewable energy.	

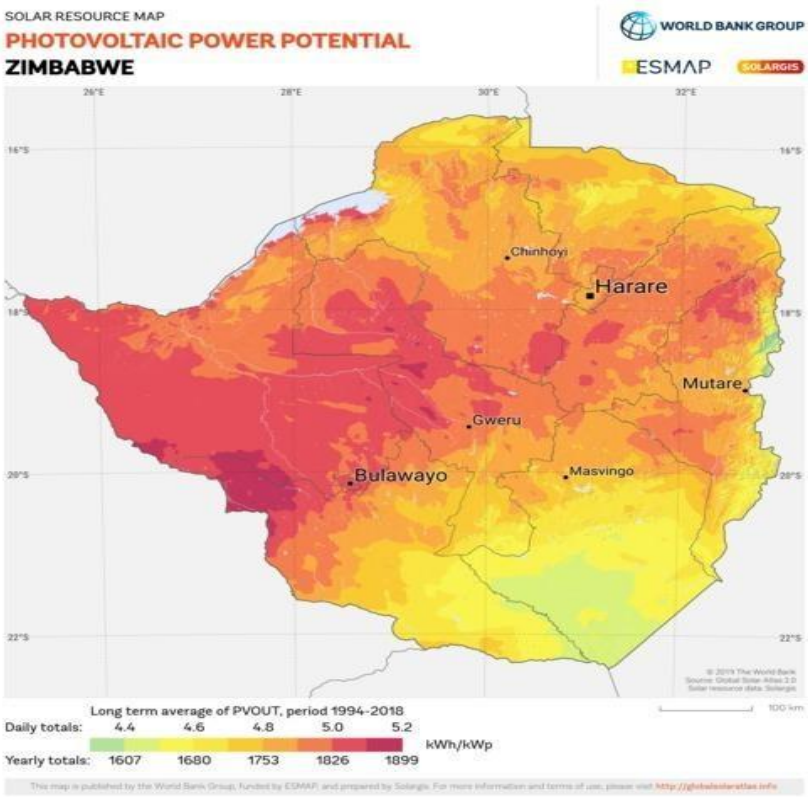
Sources: Gerede (2020); IEA (2020)

2.8 ZIMBABWE'S RENEWABLE ENERGY POTENTIAL

2.8.1 Solar

Zimbabwe has a strong potential for electricity generation from solar. Solar resources remained largely untapped. According to the Africa-EU RECP (2018), the average solar irradiation is 5,7 kWh/m2/day with the North and West regions of the country having the highest irradiation potential as demonstrated in Figure 1.

Figure 1: Solar Potential



Sources: World Bank (2019)

Zimbabwe have 16 Mega joules daily of solar power especially on the western part of the country including Matabeleland, which is three times the global average and this potential alone can minimize energy poverty (Marowa, 2018). It is estimated that solar

PV has a technical potential of over 500MW. Solar energy potential of Zimbabwe is very high, with an average 300 days equivalent to 3000 hours of sunshine per year.

2.8.2.1 Current Solar Projects and Initiatives in Zimbabwe

Government Projects and Initiatives

The government through its SOE, Zimbabwe Power Company, signed a contract with Intratek (contracted partner via tendering process) in 2015 for the construction of three Solar PV projects in Gwanda, Insukami and Munyati. The project was projected to be completed in a period of 24 months according to the signing agreement. Each and every Solar PV plant was expected to generate a capacity of 100 MW to make it 300 MW in total. The estimated projected cost was US$500 million (ZPC, 2018).

After five years that ZPC and its contractor Intratek signed the contract, there has not been much development. It is discouraging that such a much-needed green project has not yielded any results due to alleged corruption, red tape, disagreements, and fraud between the two contractual parties.

Private Sector Initiatives

There are a lot of private sector initiatives and projects aiming to tap on the potential of the Solar energy. The following are some of the projects in the process of being planned and implemented, the Soventix 22 MW Solar PV project, Southpole Consulting's 125 MW Solar PV plan, Old Mutual's 50 MW Solar power plant just to name a few. Some projects are completed and installed successfully, for example, the MEECO Group installed the largest solar power plant in Zimbabwe in 2017 with a total capacity of 216-kilowatt peak (kWp). This a great initiative and turning point in Zimbabwe which is largely dependent on fossil fuels.

2.8.3 Hydropower

According to GET.Invest (2020), gross theoretical hydropower potential in Zimbabwe is 18,500 GWh/year. The technically feasible potential is 17,500 GWh/year, of which 19% has been exploited. The installed capacity of hydro-power is 1050 MW (http://www.zpc.co.zw/). Hydropower accounts for 47% of electricity production in Zimbabwe. Apart from ZPC's hydropower generation, it is believed that the potential for small-hydro-power is 120 MW (REEP, 2012). There are few IPPs producing power via small hydro-power system and these

include Pugwe 2,5 MW, Pungwe B 2,7 MW, Duru 2,2 MW and Nyamingura with 1,1 MW. The Hydro power potential, just like any other renewable energy technology is not spared from common militating factors such as lack of funds, lack of political will and limited technology. There is need to grow the potential of hydropower systems in order to reduce dependency on fossil fuels, which are responsible for polluting the environment.

2.8.4 Wind

There is relatively low wind speeds of about 3.5 m/s that militate against Zimbabwe's efforts at developing wind energy technology. Nevertheless, in some areas such as the Eastern highlands, a 300 km stretch of mountains, and in Bulawayo speeds of between 4 and 6 m/s have been recorded and that might point to a positive future in the efforts to develop wind energy technologies (REEEP, 2012).

2.8.5 Geothermal

50 MW of geothermal potential were identified in 1985, but there is not much has been done concerning this source of energy in Zimbabwe (GET.Invest(2020). However, Zimbabwe might benefit because of its close location to the Great Rift Valley points to the potential presence of geothermal energy. The great rift valley is associated with hot springs and stretches for over 6000 km from Lebanon to Mozambique. However, there is need for much more research into this area before any meaningful initiatives are taken into account. (REEEP, 2012).

2.8.6 Bioenergy (Biomass and Ethanol)

Biomass is an important source of energy in Zimbabwe that caters for up to 85-90% in the remote areas (REEP, 2012). However, chopping of wood to use as a fuel has become unpopular among the climate change specialists, environmentalists and other sustainable development specialists, citing deforestation effects and the need to protect nature and the environment. This has prompted the need to provide remote areas with solar as a source of energy to combat deforestation.

The first attempts of ethanol gasoline in Zimbabwe, took place in 1980. Hence, the government accelerated this amazing green project by initiating the Chisumbanje Ethanol project. The Chisumbanje Ethanol project is dubbed as a national government project which is very crucial and where Ethanol is produced from the sugarcane plant. The Chisumbanje plant has the total capacity to produce 120 million litres of high quality, anhydrous ethanol

per annum, along with a capacity to generate 18 MW of electricity. A plant with a capacity of 18 megawatts of electricity can power up to 30 000 households (The Herald, 2015). However, in the long term, these kind of projects may not be sustainable because they are competing for arable land

Table 3: Bioenergy IPPs

Plant Owner	**Plant Name**	**Capacity MW**	**Status**
Triangle Ltd	Triangle Plan	45	Operational, uses bagasse (biofuel)
Hippo Valley Estates	Chiredzi Sugar Mill	33	Operational, uses bagasse (biofuel)
Green Fuel	Chisumbanje	18	Operational, uses bagasse (biofuel)
Border Timbers	Charter Plant	0,5	Operational, uses biomass (wood waste)

Source: ZERA (2020)

2.9 ZIMBABWE'S POWER SECTOR (ELECTRICITY) SITUATION AND PERFORMANCE SINCE 2000

Since the year 2000 to date, the electricity situation remained poor due to a number of political, economic, and social factors. The country's economy has been descending due to political factors such as the fast track land reform. Inevitably, the power sector was not spared but also suffered the consequences. Zimbabwe's political and diplomatic relations with the west also soured at the same period forcing the suspension of much needed debts from the Paris Club. Economic sanctions were also imposed on the country making it difficult for the country to achieve its policy targets. In addition, the feeble power sector is also a result of systematic corruption among government officials. This downward spiral has seen the country facing numerous unplanned blackouts.

Inflation and lack of foreign currency also exacerbate the bad electricity situation. The situation has since gotten worse each year. Since 2019, Zimbabwe is enduring an unprecedented electricity crisis which has prompted up to 18 hours a day of so-called load shedding, because the grid cannot generate enough energy to meet national demand or pay for adequate power imports, owing to foreign-currency shortages (Murekedzi, 2019).

The country has an installed generation capacity of just over 2,000 megawatts (MW), but currently, Kariba South Power Station, which generates more than 50 percent of the country's electricity, was producing a mere 238 MW, while Hwange Thermal Station, the second-biggest power generator, was producing 374 MW, leaving the country with a massive power deficit that can only be mitigated by expensive imports from Mozambique and South Africa (Murekedzi, 2019).

But for all its electricity shortages, Zimbabwe is endowed with abundant renewable energy resources such as solar and hydropower near natural landmarks such as Victoria Falls not to mention biomass, geothermal, and to a lesser extent wind power that present a major opportunity for investment. However, some experts argue that wind power is not suitable in Zimbabwe, due to slow wind speed. However, other resources have remained largely untapped.

2.10 GAPS IN KNOWLEDGE

Despite of the various literatures concerning Germany's Energiewende and what Zimbabwe can learn, it is still very limited. Judging from various literatures of German's experience, the comparison of how other countries can gain or learn has been overlooked. Much attention has been given to other factors not related to comparison study or analysis. The study also seeks to investigate on w. Therefore, the area of focus for this study remained under-explored, therefore this research was aimed at contributing towards gathering knowledge that would help in closing this gap.

2.11 CHAPTER SUMMARY

The study in this chapter explored various literatures and researches in order to understand the concepts of Germany's energy turn-around (Energiewende) as well as Zimbabwe's power sector situation. Various key words and variables such as energy democracy were also defined. The examination of other studies regarding the topic in question, assisted in the identification in the gaps of knowledge**.**

CHAPTER 3: METHODS

3.1 INTRODUCTION

In this chapter, the researcher gives an overview of the methodology and methods which were used in this study. The researcher employed both qualitative and quantitative methods in order to overcome limitations inherent in each of the procedures. This chapter also considered data analysis and ethical considerations. The handling of ethical issues such as confidentiality and informed consent were also be included in this chapter.

3.2 SAMPLE SELECTION

Bhattacherjee (2012) defined sampling as the statistical process of selecting a sub-set of a population of interest for purposes of making observations and statistical inferences about that population. Latham (2008) defined sampling as taking of a representative selection of the population and using the data collected as research information. Frey, Carl and Gary (2000) defined a sample as a "sub-group of a population". Sampling is divided into two categories namely non-probability sampling and probability sampling. Fink (1995) defined probability sampling as a method in which "every subject or unit has an equal chance of being selected" from the population. Types of probability sampling include simple random sampling, stratified random sampling and cluster sampling. Types of non-probability sampling include purposive sampling, snowball, convenience sampling and quota sampling (Fink 1995; Frey et al, 2000).

In this study, the researcher used purposive sampling on the basis of the subjects' expertise and knowledge in the area being studied. In addition, the decision to adopt purposive sampling is influenced by the nature of this research aims.

3.2.1 Criteria Used For Sample Selection and Type of Questions

The field of energy is very technical and require experienced people with knowledge on the subject in question. It is impossible to collect data randomly when dealing with a deep subject of energy policy. The participants were chosen based on the following facts:

- Educational qualifications,
- Designation or post being held by the participants
- Strong background in renewable energy projects

The type of questions were both closed-ended and open-ended. This was done to allow or combine quantitative and qualitative data. The qualitative questions helped to explain the numbers (quantitative) in order to make the results meaningful. Please see a sample attached as **Annexure (at the end)**.

Population of the Study and Area

The population of the study consisted of experts, engineers and policy-makers employed in a public sector organization in the energy fraternity. A parastatal was chosen for data collection. The study area was the city of Harare and Bulawayo in Zimbabwe. However, the original plan was to collect data from at least five major cities but due to the COVID-19 pandemic's lockdown rules, the researcher's travelling schedule was restricted.

Sample of the Study

Only participants with expertise in the area of this study were included. In this study, 53 subjects were selected to take part in the study. The majority of the participants who took part in this study have strong background and expertise in Zimbabwe's new Renewable Energy Policy document. The sampling method used in this study is discussed next.

3.2.2 Purposive Sampling

This method will employed because it can facilitate a complete examination of how best can Zimbabwe learn from Germany's experience. In addition, this method allowed the researcher to select participants based on the expertise of the participants; and to be able to make meaningful, workable responses to address the topic in question.

According to Babbie (1990) purposive sampling is also known as judgemental or judgement sampling. Purposive sampling is selecting a sample "on the basis of your own knowledge of the population, its elements, and the nature of your research aims (ibid, 1990). That is the population is "non-randomly selected based on a particular characteristic" (Frey et al. 2000). The individual characteristics are selected to answer necessary questions about a certain matter or product (MacNealy, 1999).

Advantages of purposive sampling

The researcher used this type of non-probability sampling because it has advantages over all other sampling methods in the sense that, by or through the participants' expertise and experience, provide the most resolute data. Most of the participants had deep knowledge about renewable energy potential since they had been trained through workshops and other means. Also, the

participants have been involved in the implementation of some green projects and policies in Zimbabwe. According to Bogdan and Biklen (1992); Umaru (2009), the cutting edge of this sampling method is that it eliminates subjects who do not fit the requirements of the entry, and therefore produces an accurate or near accurate sample.

3.2.3 Selected Participant Organization: Zimbabwe Power Company

The participants who took part in this research are high-ranking employees of the Zimbabwe Power Company. Initially, the original plan was to include participants from at least three different organizations. Unfortunately, only Zimbabwe Power Company responded in time and showed willingness to participate in this study. The other two organizations reverted due to the fear of coronavirus. The research managed to collect data from both Harare city and Bulawayo offices (Zimbabwe Power Company).

3.3 METHODS OF DATA COLLECTION

In this study, the researcher utilized both primary and secondary data as a method of data collection (**please see attached sample annexed at the end**). Hox and Boeije (2005) defined primary data as the original data collected for a specific research goal. In other words, primary data is information collected directly from firsthand experience. In this study, the researcher collected primary data through the distribution of self-administered questionnaires to the selected participants. According to Hox and Boeije (2005) secondary data is the data originally collected for a different purpose and re-used for another research question. It is the published information collected in the past or from other parties (De Vos, 2002). The researcher also used secondary data in the form of document analysis so as to answer the research questions. In this manner, the researcher made use of scholarly articles, scholarly journals, books, thesis and dissertations, newspaper articles and various relevant reports.

3.4 DATA COLLECTION INSTRUMENTS

3.4.1 Questionnaires

The researcher employed self-administered questionnaires to gather data from the respondents. According to Abawi (2013), a questionnaire is a data collection instrument consistent of a series of questions and other prompts for gathering information from respondents. A single questionnaire contained both open-ended and closed ended questions to derive both qualitative and quantitative data that will yield rich analytical and descriptive findings. In compiling or designing the questionnaire, the researcher included only relevant questions that are in line with the research objectives. The questionnaire also outlined the purpose of the study. The researcher also included clear instructions and space for answers and administrative details.

For this research, a Likert scale type of questionnaire (which included follow up qualitative questions) was used for data collection. Fifty-three questionnaires were distributed. Out of the fifty-three, only three participants defaulted.

Advantages of questionnaires

The participants were be able to complete the questionnaire in their own time without any interferences by the researcher. Also, the questionnaires are more objective in comparison to other data collection instruments such as interviews, observations, just to mention a few. According to Gall, Borg and Gall (1996), the use of questionnaires eliminates personal bias of the researcher since there is no direct interaction between the researcher and the participants when the questionnaires is being completed.

Limitations of questionnaires

Even though questionnaires are highly reliable, there were also be setbacks in using questionnaires. Other three respondents of a total fifty-three who decide not to return the questionnaires affected the response rate. The researcher, however, did everything possible to utilize the data provide by those who returned the questionnaires.

3.4.2 Documentary Review

The researcher also utilized document review as part of this study. With various rich literatures by other scholars, and researchers, the researcher was be able to utilize the information in order to answer the research's questions and objectives.

Advantages of documentary review

Document review is relatively inexpensive. In addition, there is abundance availability data and information on the internet. Review of documents also provided good source of background information. By utilizing document review, the researcher was be able to bring up issues not noted by other means (questionnaires). The idea behind the use of this collection tool was to make a fair evaluation concerning energy democracy and Germany's transition to renewables. An evaluation was also be made concerning possible challenges that may be experienced in trying to transfer the knowledge and technology from Germany to Zimbabwe.

Limitations of documentary review

The biggest challenge of this method was that some of the data proved to be inapplicable, disorganized and out of date; however, the researcher did his best to utilize relevant available

information. From an individual perspective, review of documents was time consuming because of many documents that are analyzed.

3.5 DATA ANALYSIS

Since this study was a combination of qualitative and quantitative data the research employed both content analysis and SPSS data analysis techniques. According to Yin (2003) "data analysis consists of examining, categorizing, tabulating or otherwise recombining the evidence to address the initial propositions of a study". Le Compte and Schensul (1999) defined data analysis as the process of reducing large amounts of collected data to make sense of them.

3.5.1 Content Analysis

In this study, content analysis was partly used to analyze reviewed documents. Content analysis was preferred instead of other options such as NVivo, ATLAS.ti that proved to be quite expensive. According to Tilpado (2014) content analysis refer to methods for studying or retrieving meaningful information from documents. In a more focused way, content analysis refers to a family of techniques for studying the "mute evidence" of texts and artifacts (Hodder, 1994).

3.5.2 Statistical Package for the Social Sciences (SPSS)

The researcher used SPSS to analyze quantitative data. SPSS is a windows based program that can be used to perform data entry and analysis and to create tables and graphs. In this study, all forms of quantitative data were analyzed through a statistical process with the assistance of a computer data analysis software, SPSS. The data was presented in tables, graphs and charts whilst the qualitative part of the data explained the meaning of these numerical findings.

3.6 ETHICAL CONSIDERATIONS

As a university student, participants were easily assured by their organization that the study is genuine and does not have any negative effects on them. Badiou (1993) stated that ethics is what we should or should not do by applying reasoning, for or against, in order to decide on the conduct to be taken when faced with a moral problem. Researchers have the responsibility to ensure that the physical, social and psychological well-being of the respondents is not harmed or damaged. The researcher also obtained the permission from the organization in which he collected the data. Participation was voluntary and participants were given informed consent letters in which they had an option to withdraw if they wished to. Anonymity and confidentiality was guaranteed through a deliberate concealment or suppression of names and titles of participants.

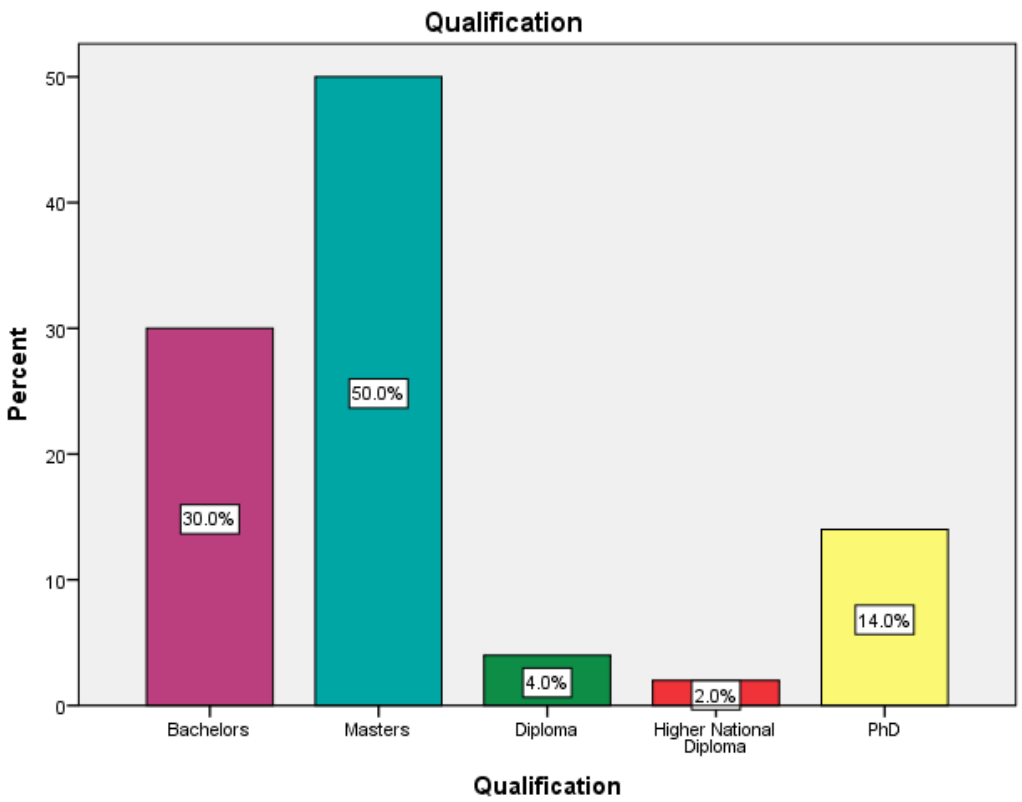
CHAPTER 4: RESULTS AND DISCUSSION

4.1 RESPONSE RATE

Selected Sample	Actual Response	Percentage (%)
53	50	94%

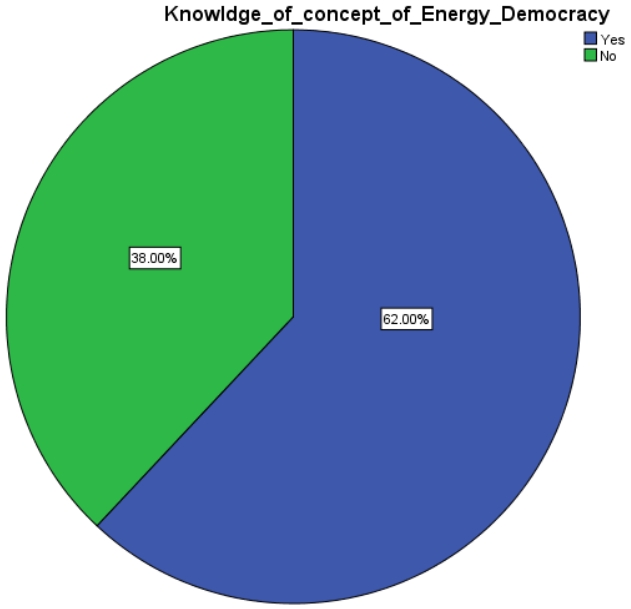
Even though three participants defaulted, the response rate of 94% was satisfactory.

4.2 QUALIFICATIONS



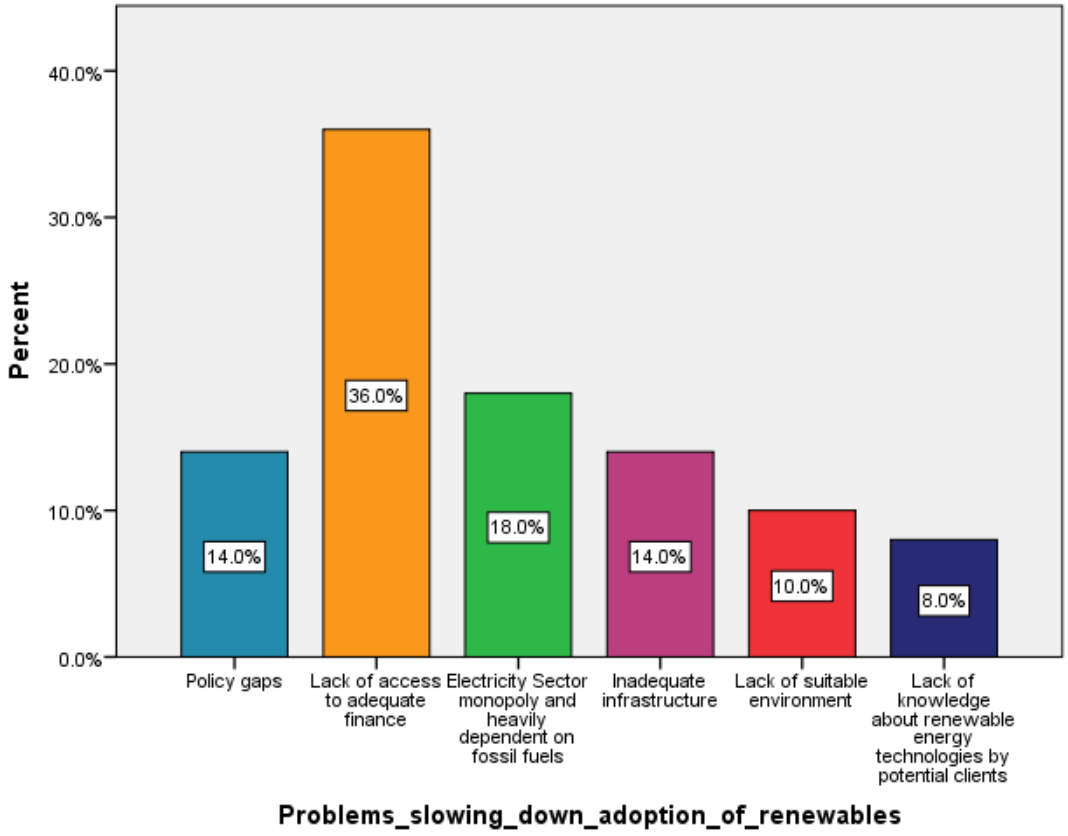
The figure shows that 30% of the respondents were Bachelor holders, 50% were Masters holders, 4% were Diploma holders, 2% were Higher National Diploma holders and 14% were PhD holders. This indicated that most of the respondents were Master holders thereby suggesting a credible knowledge of the subject matter.

4.3 KNOWLEDGE OF ENERGY DEMOCRACY CONCEPT



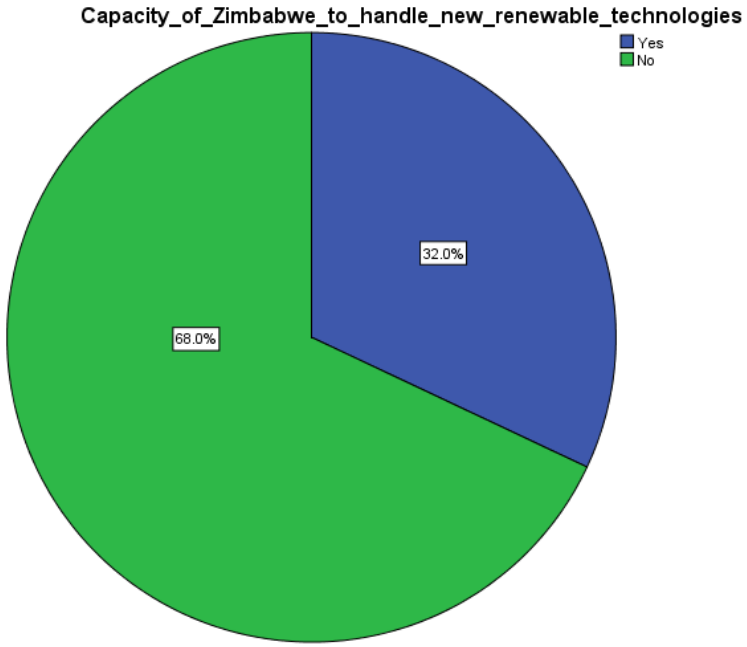
The study sought to understand the knowledge level of respondents as regards renewable energy as energy produced from sources that do not deplete or can be replenished within a human's lifetime and energy democracy concept. The majority of the respondents (62%) highlighted that they had knowledge of the energy democracy concept whilst 38% stated that they had no knowledge. Those who were familiar with the concept defined energy democracy as a situation in which energy production and distribution is not solely controlled by the state through its institutions. The results above shows the frequency of findings in accordance to the respondents knowledge of energy democracy concept.

4.4 FACTORS SLOWING-DOWN ZIMBABWE FROM ADOPTING RENEWABLES TO IMPROVE ITS ELECTRICITY PROBLEMS



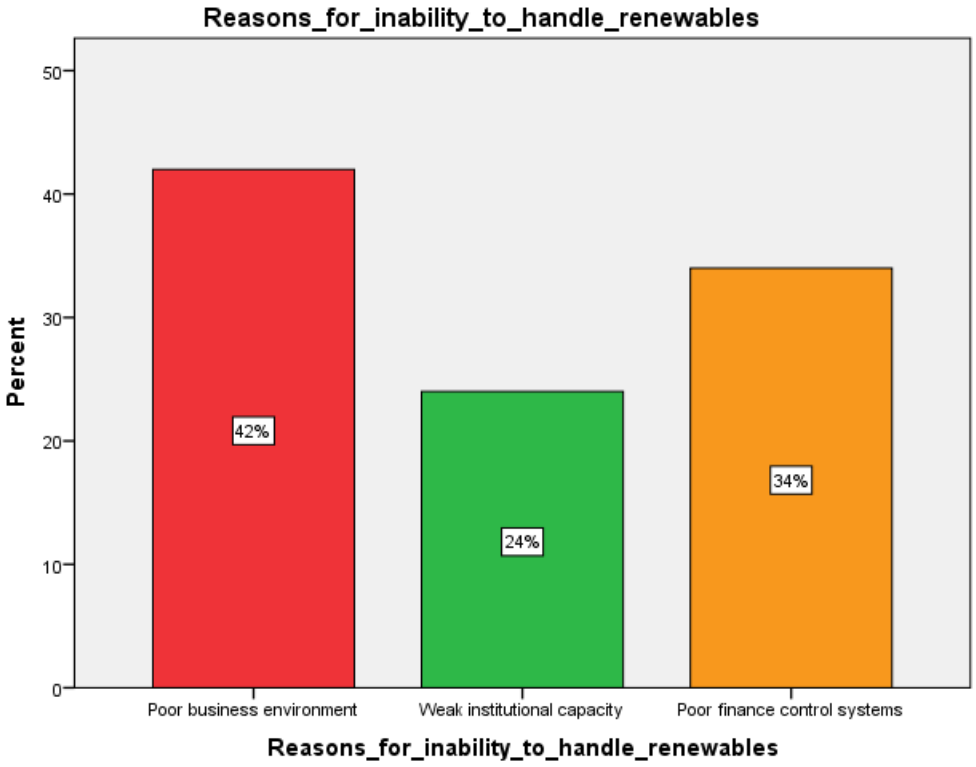
The figure above shows the factors slowing down Zimbabwe from adopting renewables to improve its electricity problems. The respondents 36% suggested lack of access to adequate finance or capital, 18% indicated electricity sector monopoly and heavy dependence on fossil fuels, (14%) indicated policy gaps, 14% stated inadequate infrastructure, 10% indicated lack of suitable environment and 8% stated lack of knowledge about renewable energy technology by potential clients.

4.5 CAPACITY OF ZIMBABWE TO HANDLE NEW RENEWABLE TECHNOLOGIES



This study further sought whether Zimbabwe has the capacity handle new renewable technologies. The majority of the respondents (68%) as shown in the figure below indicated that Zimbabwe is incapacitated whilst 32% stated that Zimbabwe has the capacity to handle new renewable technologies.

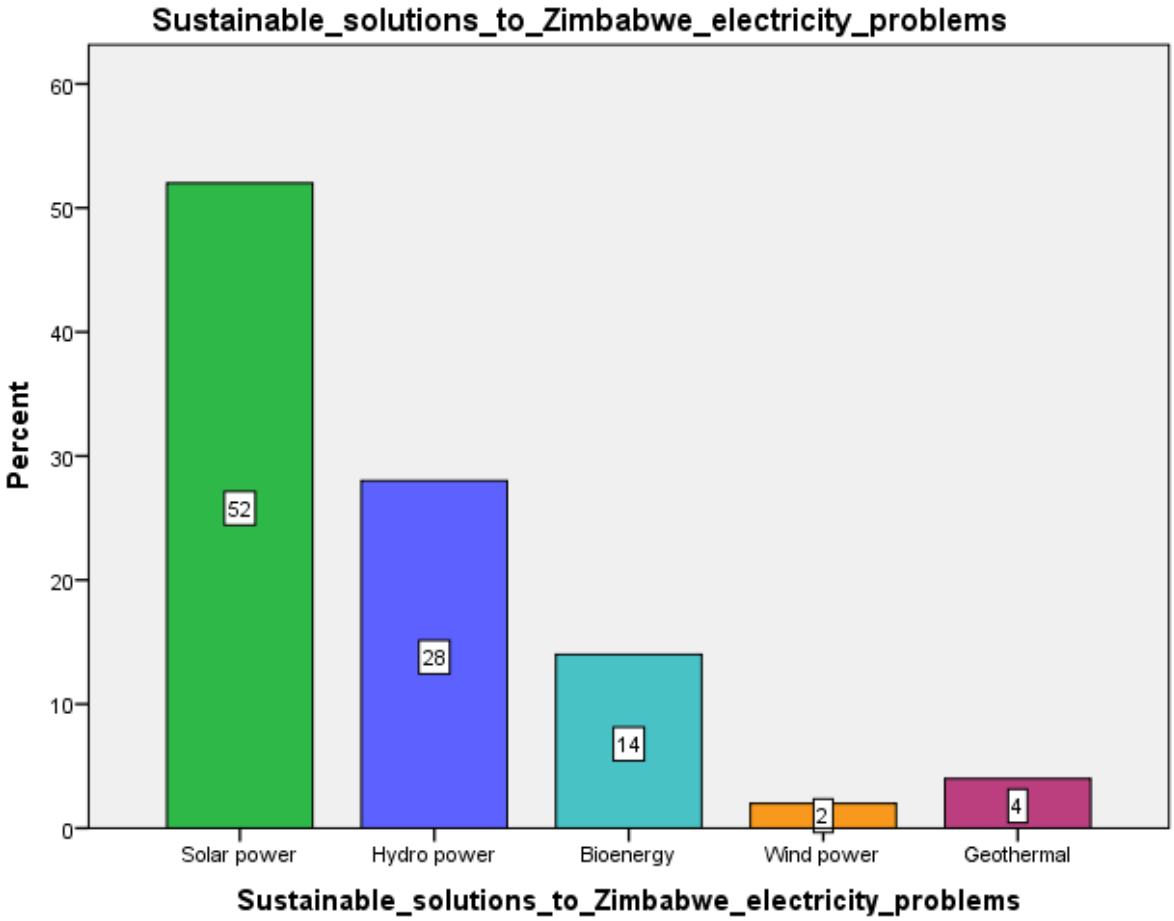
4.6 **REASONS FOR INABILITY TO HANDLES RENEWABLE ENERGY PROJECTS**



The respondents that stated that Zimbabwe was incapacitated suggested that poor business environment (42%), weak institutional capacities (24%) and poor finance control systems (34%) were the reasons to that effect. This suggested that Zimbabwe should improve its business environment and strengthen its institutional capacity in order to handle renewables. More finance is also required and this can be done by creating a sovereign wealth fund among other measures.

4.7 SUSTAINABLE TECHNICAL SOLUTIONS REQUIRED TO IMPROVE ZIMBABWE'S ELECTRICITY PROBLEMS.

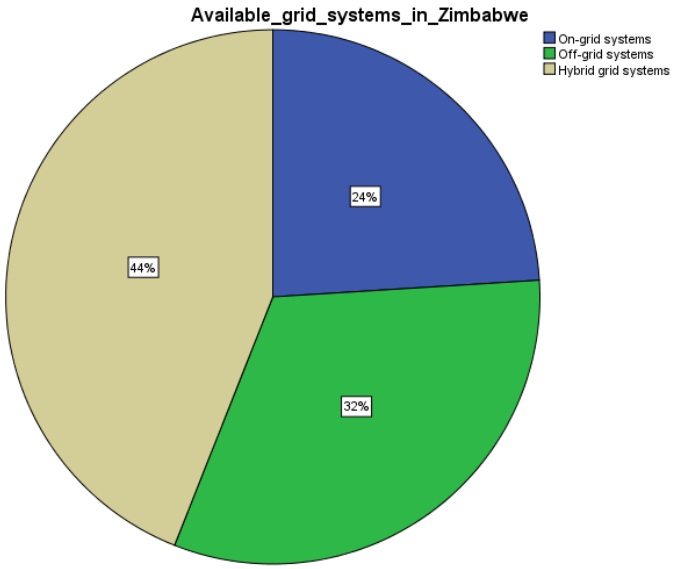
The study also sought to understand the most feasible or applicable sustainable technical solutions that would be implemented or adopted to improve Zimbabwe's electricity problems.



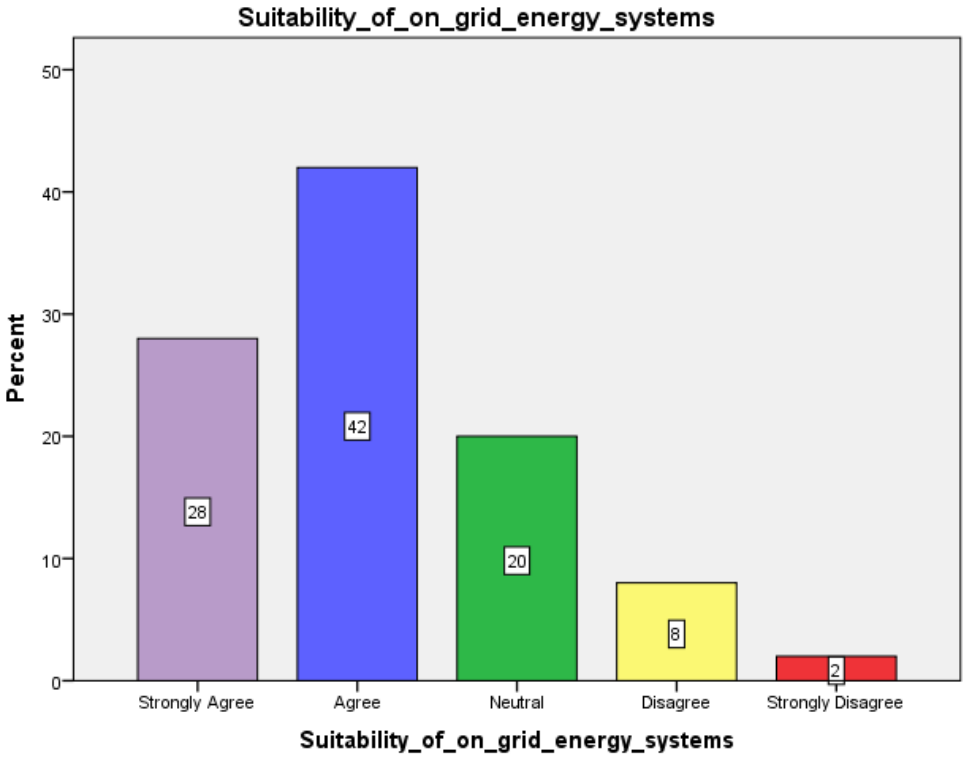
More than half of the respondents (52%) indicated that solar power was critical to solve Zimbabwe's electricity problems. 28% of the respondents stated hydroelectric power, 14% suggested bioenergy, 2% stated wind power and 4% stated geothermal as technical solutions to Zimbabwe electricity problems.

4.8 AVAILABLE GRID SYSTEMS IN ZIMBABWE

The figure below shows the available grid systems in Zimbabwe.

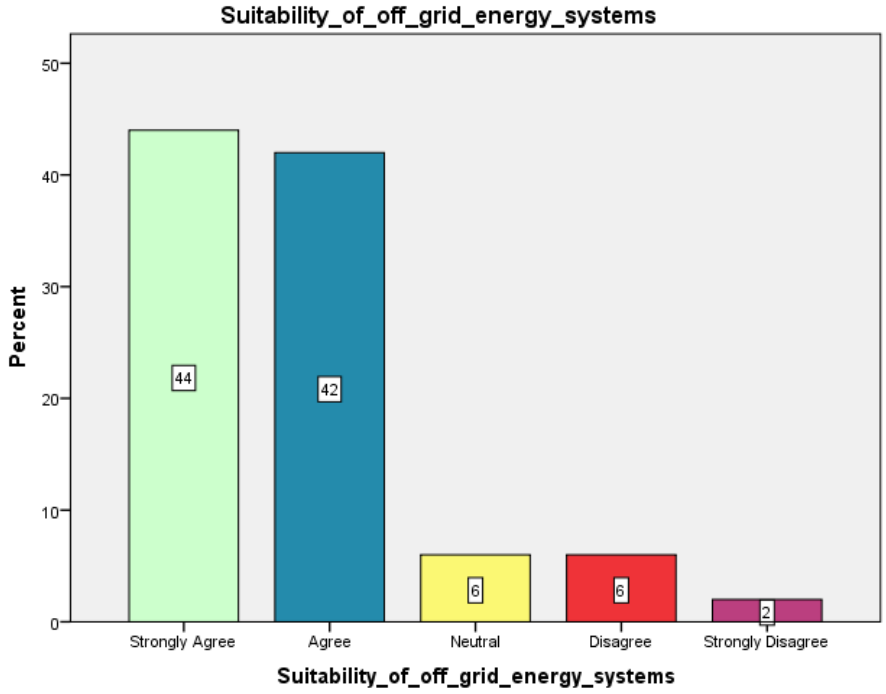


4.9 SUITABILITY OF ON GRID ENERGY SYSTEMS



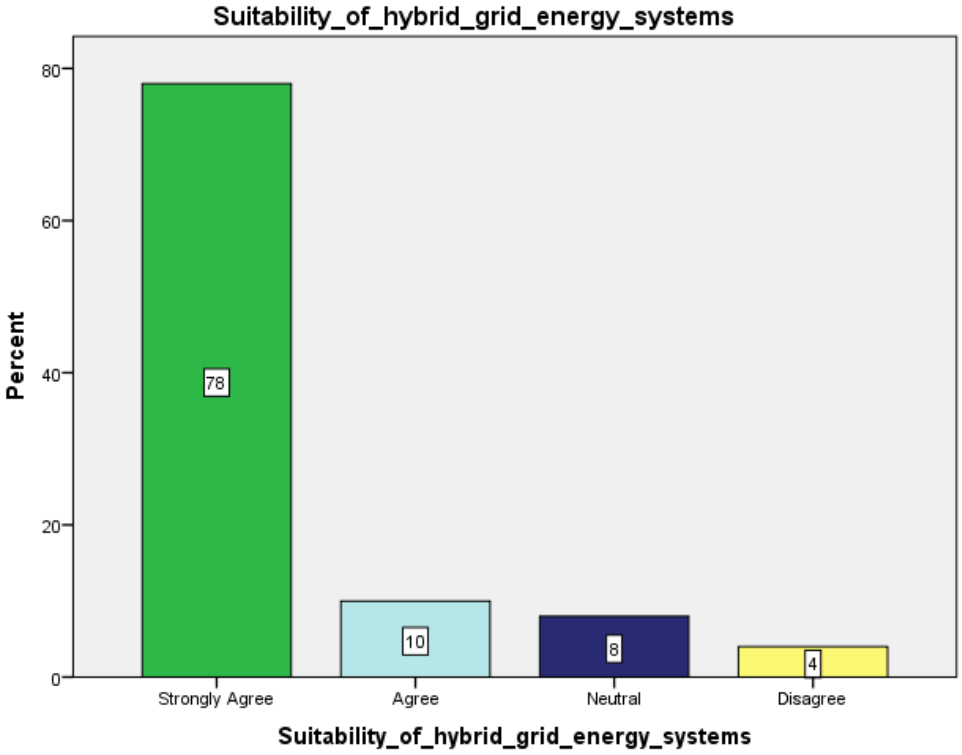
The respondents, 42% agreed that an on grid system is suitable, whilst 28% strongly agreed, followed by 20% who remained neutral. However, 8% disagreed and a paltry 2% strongly disagreed.

4.10 SUITABILITY OF OFF GRID ENERGY SYSTEMS



The respondents 44% strongly agreed, 42% agreed, 6% were neutral, and 6% disagreed that off grid systems are more suitable for Zimbabwe. It was noted that the majority of the respondents suggested that off grid initiatives are pro-poor and would enable people in remote areas to access electricity.

4.11 SUITABILITY OF HYBRID ENERGY SYSTEMS



The results above suggested that most of the respondents 78% favoured hybrid systems over the other grid systems implemented separately. This was because the systems are flexible as both solutions can be applied or implemented depending on circumstances and situation. A hybrid grid accommodates for changing mixes of generation, transmission and distribution, delivery form and control technologies.

CHAPTER 5: SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

This chapter summarises the study and the findings. Recommendations, conclusions of findings were also included in this chapter. In addition, the researcher proffers recommendations for solutions to the problem, which was identified by the study. The researcher also included the concluding remarks of this study.

5.2 SUMMARY OF FINDINGS

5.2.1 Position Status and Qualifications

Half of the respondents were holding directorship posts, whilst about 44% of the participants were managerial posts holders. Over 50% of the participants had at least a Master's Degree or better. About 30% of the participants had a first degree. The strong designation of participants clearly shows that the responses were highly reliable. In addition, the participants' robust education qualifications meant that they gave accurate answers.

5.2.2 Knowledge of Energy Democracy Concept

The fact that 62% of the respondents proven to have knowledge of the concept of energy democracy is a clear testimony that the feedback was from high quality sources. The 38% may not necessarily mean that they do not know, but in fact, they were just unfamiliar with the concept and not experience.

5.2.3 Factors Slowing-Down Zimbabwe from Adopting Renewables to Improve Its Electricity Problems

The majority of the respondents, 36% totally believe that lack of adequate funding is the obstacle slowing down Zimbabwe from adopting renewables to improve its electricity woes. Whilst 18% indicated the government's reluctance to allow decentralization of power distribution in favour of monopoly is the reason why Zimbabwe is not progressing. The remaining respondents pointed out the following as the reasons why Zimbabwe is not progressing, policy gaps; inadequate infrastructure; unfavourable business environment and lack of knowledge concerning renewable energy by potential clients.

5.2.4 Capacity of Zimbabwe to Handle New Renewable Technologies

The majority of the respondents 68% think that Zimbabwe is incapacitated to handle new renewable technologies such as those found in Germany. Lack of critical infrastructure may be the reason why the majority of the respondents do not believe that Zimbabwe is capacitated to

handle new renewable technologies. On the other hand, 32% are of the view that Zimbabwe has the capacity to handle new renewable technologies.

5.2.5 Reasons for inability to handle new technologies

On this aspect, the respondents gave a balanced view of possible reasons concerning Zimbabwe's inability to handle new renewable technologies. About 42% expressed, that poor business environment is responsible whereas 34% pointed out lack of finance or poor finance control systems. Weak institutional capacities was another point raised by 24% of the respondents.

5.2.6 Sustainable Technical Solutions Required to Improve Zimbabwe's Electricity Problems.

When it comes to issues of renewable energy, each country or region differs on the technologies that works best. In other words, there is no one size fits all approach when it comes to renewable technology implementation in different countries. In the case of Zimbabwe, over half of the respondents 52% pointed out that Solar power is the most feasible sustainable technical solution basing on the fact that there are over 300 days of sunshine in a calendar year. Due to the abundance or availability of water bodies in Zimbabwe, 24% are of the view that Hydropower is the best sustainable technical solution required to solve the country's power crises. The remaining respondents suggested bioenergy, wind and geothermal as potential feasible technical solutions to save Zimbabwe form its dire electricity situation.

5.2.7 Available Grid Systems in Zimbabwe

The results showed available grid systems in Zimbabwe. The results which shows that the hybrid grid system covers 44%, whilst the off grid system covers 32% and lastly ongrid systems with 24%. These results might have been influenced by the fact that the majority of the population in Zimbabwe reside in rural areas.

5.2.8 Suitability of On Grid Energy Systems

As the results indicated, 42% believe that the on grid system is suitable for Zimbabwe in the context of renewable energy development for power distribution. The evidence is even much stronger with 28% strongly agreeing on the suitability of this system. Some, 20% were not sure and the remaining few, 10% disagreed. The good part about on grid system is that it does not require using any kind of batteries and this may be cheaper.

5.2.9 Suitability of Off Grid Energy Systems

Given the fact that the majority of Zimbabwe's population live in remote areas, 44% of the respondents strongly agreed on the suitability of this system. At the same time, 42% agreed whilst 6% remained neutral and the few disagreed. However, most of these stand-alone systems depend on the willingness of investors or NGOs to implement these kind of systems. Due to limited public funds, the government is not in a strong position to fund these at a required pace.

5.2.10 Suitability of Hybrid Energy Systems

In comparison to the other mentioned systems above, the hybrid system received a lot of attention from the respondents. Those who strongly agreed constitute 78% in addition to the 10% who simply agreed. In essence, 88% are of the same view that the hybrid system is the most suitable for a Zimbabwean scenario. Only a few 8%, remained neutral whilst 4% disagreed. On grid and off grid are good but only when there is ample of sunlight. As soon as the sun is less bright, in night or in rainy seasons, these systems are not helpful and there will be a need for other energy options. The solution to this problem is the hybrid solar energy systems. Generally, the hybrid solar systems are the systems combining two renewable sources of energy, like solar and wind. Diesel generators may support a hybrid system as well in the night or when there is no sunlight. All these advantages may justify why 88% agreed that this is the most suitable system in the interest of renewable energy development for electricity generation.

5.3RECOMMENDATIONS

5.3.1 The government should stop corruption in national renewable projects

Corruption is the biggest cancer eating Zimbabwe's chances or potential to achieve its renewable goals. Some of the renewable projects commissioned by government do not follow due diligence but are carried out in an unquestionable manner. Contracts and tenders are given out to bogus companies who lack sufficient references and capacity to complete national projects. For example, the Intratek-Zimbabwe Power Company scandal that occurred in 2015. Intratek, a private company was given a tender without a bank security for the 200 MW Solar Gwanda Project. Up to date, the Solar Gwanda Project is not completed. This is a pure example of how corruption is dragging Zimbabwe backward. The government must institute serious measures to curb corruption if there is going to be any possibility of improvement.

5.3.2 Zimbabwe should improve its business climate

"Zimbabwe is open for business"! The catchy slogan of the new Zimbabwean government is clear and inviting. In reality, is that slogan being implemented? Since the new republic took over in November 2017, Zimbabwe's business climate went from worse to bad. Nobody want to invest in a toxic business environment no matter how

5.3.3 Policy consistency on the part of the government

Zimbabwe's government is well known for flip-flopping when it comes to policies. In other words, there is no consistency on the part of the government's policies. Investors are afraid to

operate in such an environment where policies change more often. If Zimbabwe is serious about renewable energy technology investments, then its policies must be consistent.

5.3.4 A sovereign wealth fund must be created to cater for new renewable energy projects

Since Zimbabwe is regarded as a high-risk destination by global institutions such as the World Bank and IMF, therefore, it is difficult to attract funding in the form of loans. Alternatively, the government must create a realistic Sovereign Wealth Fund in order to fund its own renewable energy national projects. A sovereign wealth fund is a state-owned investment fund comprised of money generated by the government, often derived from a country's surplus reserves.

5.3.5 Power generation should be decentralized

Centralization and monopolization of energy production, distribution and supply in Zimbabwe is one of the factors militating against renewable energy development. In addition, the government is still heavily dependent on coal, something that is against SDGs. Energy democracy cannot survive in a centralized environment; hence, the government should embark on devolution of power when it comes to power generation. Since 1980, Zimbabwe has known one power company, ZESA. The current electricity regulatory structure impedes full participation of independent power producers (IPPs) and “protects ZESA’s monopoly”. Lack competition in the power generation sector promotes poor service delivery as can be witnessed with frequent power cuts. With ZESA facing a myriad of problems such as obsolete equipment, lack of operating capital and huge debt overhang, IPPs through decentralization are the realistic solution to Zimbabwe’s power woes. IPPs in Zimbabwe reportedly have potential to generate up to 5000MW.

5.3.6 The government should focus on micro-hydro projects that are less costly

Zimbabwe is a country with abundance water bodies. Inevitably, venturing into big and costly hydro projects may be difficult considering the fact that the government is short of public funds. The most feasible quick solution may be to focus on micro-hydro projects that are less costly and flexible to implement. This may not be a permanent solution, but it may be helpful to solve the country’s electricity woes.

5.4 CONCLUSIONS

The study looked on the concept of energy democracy and Germany’s transition to renewable energy with an aim to establish what Zimbabwe can learn to end its electricity power woes. The researcher also assessed on the policies and strategies that Germany adopted in order to determine if any knowledge can be imported in the context of the Zimbabwean situation. Therefore, the researcher managed to highlight the factors militating against the progression of renewable energy

as a panacea to Zimbabwe's power challenges. Policy gaps; inadequate infrastructure; unfavourable business environment and lack of knowledge concerning renewable energy by potential clients were identified as some of the factors militating against renewable energy progression. As a solution, the researcher recommended for policy consistency, stamping down of corruption, abolishment of bureaucracy and red tape among other recommendations. The researcher is calling for more related studies in order to bring more solutions to the table. More countries should also be used as case studies.

CHAPTER 6: REFERENCES

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CHAPTER 7: APPENDIX

Appendix A: Questionnaire

NAME OF THE STUDENT: ***Shingirayi Kondongwe***

PROGRAMME: ***MSc in Energy Policy***

QUESTIONNAIRE

TITLE: **Energy democracy and Germany's transition to renewable energy: What can Zimbabwe learn to end its electricity power woes?**

Purpose

The purpose of this study is to contribute to resolve the electricity energy crises in Zimbabwe. The expectation is to develop policy recommendations and methodologies that will enable Zimbabwe to realize its renewable energy potential.

Confidentiality and anonymity

This is a type of **anonymous** data collection, hence sensitive information such as your name and surname is not required for ethical reasons. Confidentiality and anonymity is guaranteed and the information that you are going to provide shall only be used for research purposes only. Details shall not be disclosed to others and any data used in the formulation will not be linked to any respondents.

BIOGRAPHICAL DATA

i. Qualifications (Highest) :

O'level	
A'level	
Bachelors	15
Masters	25
Diploma	2
Higher National Diploma	1
Doctorate	4
Ph.D	3

ii. Position/Designation:

Technical officer

INTRODUCTORY QUESTIONS

What do you understand about the concept of *Renewable Energy*?

Renewable energy is energy produced from sources that do not deplete or can be replenished within a human's life time

Have you ever heard about the concept *Energy Democracy*? *(Tick in the boxes below)*

YES	31
NO	19

If *YES*, what do you understand about the concept?

This a situation in which energy production and distribution is not solely controlled by the state through its institutions.

CATEGORY A *(please tick and answer in the spaces provided below)*

Question 1

What do you think is slowing-down Zimbabwe from adopting renewables to improve its electricity problems?

a) Policy gaps (lack of feasible policy measures)

Strongly Agree	17
Agree	15
Neutral	10
Disagree	5
Strongly Disagree	3

b) Lack of access to adequate finance (capital)

Strongly Agree	39
Agree	5
Neutral	2
Disagree	4
Strongly Disagree	0

c) Energy/Electricity Sector monopoly and heavily dependent on fossil fuels

Strongly Agree	18
Agree	20
Neutral	2
Disagree	7
Strongly Disagree	3

d) Inadequate infrastructure

Strongly Agree	35
Agree	7
Neutral	5
Disagree	1
Strongly Disagree	2

e) Lack of suitable environment (bureaucracy, red tape and weak institutional capacity)

Strongly Agree	15
Agree	11
Neutral	9
Disagree	10
Strongly Disagree	5

f) Lack of knowledge about renewable energy technologies by potential clients

Strongly Agree	27
Agree	16
Neutral	2
Disagree	2
Strongly Disagree	3

g) Any OTHER than the ones provided above

Lack of political will and hostile political environment

Question 2

a) Do you think Zimbabwe has the capacity handle new renewable technologies?

YES	16
NO	34

If YES/NO, please explain your reason below

Zimbabwe should improve its business environment and strengthen its institutional capacity. More finance is needed and this can be done by creating a sovereign wealth fund.

Question 3

a) What are the most feasible/applicable sustainable technical solutions that may be implemented/adopted to improve Zimbabwe's electricity problems?

Solar-power (photovoltaic and solar thermal)	26
Hydro-power	14
Bioenergy	7
Wind power	1
geothermal	2

b) Any OTHER than the ones provided above

The answers above are sufficient

CATEGORY B

Question 4

Which one of the following will be more suitable for Zimbabwe?

a) Grid-Connected Renewable Energy Systems (On grid Solutions)

Strongly Agree	14
Agree	21
Neutral	10
Disagree	4
Strongly Disagree	1

Briefly explain your choice/answer you stated above

On grid is good, as it will improve urban electricity supply

b) Off-Grid or Stand-Alone Renewable Energy Systems (Off Grid Solutions)

Strongly Agree	22
Agree	21
Neutral	3
Disagree	3
Strongly Disagree	1

Briefly explain your choice/answer you stated above

Off grid initiatives are pro-poor and will enable people in remote areas to access electricity

c) Both (On Grid and off grid)

Strongly Agree	39
Agree	5
Neutral	4
Disagree	2
Strongly Disagree	0

Briefly explain your choice/answer you stated above

Because both solutions can be applied/implemented depending on circumstances and situation. This approach is flexible

THANK YOU FOR YOUR HELP

Appendix B: Data collection letter

Flat No. 21

Rosewill Flats

Corner Livingstone and 8th Street

Harare, Zimbabwe

RECEIVED
ZIMBABWE POWER COMPANY
(PRIVATE) LIMITED
10 SEP 2020
MANAGING DIRECTOR'S OFFICE
12TH FLOOR, MEGAWATT HOUSE
44 SAMORA MACHEL AVENUE

10 September 2020

The Managing Director

Zimbabwe Power Company

12th floor, Megawatt House,

44 Samora Machel, Harare, Zimbabwe

Dear Sir/Madam

RE: REQUEST FOR CLEARANCE AND PERMISSION TO COLLECT DATA FOR RESEARCH PORPOSES INCLUDING A **TWO-WEEK INTERNSHIP** AS PART OF ACADEMIC REQUIREMENTS

The above matter refers.

My name is Shingirayi Kondongwe, a MSc student of Energy Policy at the Pan African University. I am conducting a Master's thesis research titled **"Energy Democracy and Germany's Transition to Renewable Energy: Lessons for Zimbabwe"**. Therefore, I am kindly requesting your permission to collect data from your organization through the distribution of questionnaires. My wish is for the questionnaire to be distributed to at least 5-10 people of your choice within your organization. The questionnaire will be very short and would not take more than 2 minutes to complete.

In addition, it is also my hope to be granted a two-week internship within your organization as part of the fulfilment of my MSc Energy Policy (Academic Requirements)

Your assistance in this research matter will be greatly. If you may need any further information, please do not hesitate to contact me. Thank you very much.

Yours sincerely,

Shingirayi Kondongwe

Mobile: 0771 644 502 Email: kondongweshingirai2@gmail.com

Appendix C: Curriculum Vitae

SHINGIRAYI KONDONGWE

Zimbabwean

Cite' Universitaire, La Rocade 4, Tlemcen, Algeria +213556693802/+263771644502

kondongweshingirai2@gmail.com / shingirayik@outlook.com ,Skype- live:shingirayik, LinkedIn: https://www.linkedin.com/in/shingirayi-kondongwe-88a19a62/

PROFILE

A young policy specialist, researcher and innovator with a strong passion for enhancing sustainable development.

EDUCATIONAL QUALIFICATIONS

Pan African University Institute for Water and Energy Sciences, Algeria Sept 2018-Aug 2020

Master of Science in Energy Policy

Midlands State University, Zimbabwe Feb 2013-Nov 2016

Bachelor of Science in Politics and Public Management Honours Degree Degree class: 1

WORK EXPERIENCE

Organization: **European Institute of Policy Research and Human Rights, Latvia** Oct 2019-Dec 2019

Position: Intern-Researcher (virtual)

- Human rights legal research
- Produced a policy research paper on human rights and business
- Carry out literature and evidence reviews
- Investor-state dispute settlement (ISDS) research and analysis
- Analysis of political issues related to the energy situation in Europe

Organization: **Nedbank Group,Harare, Zimbabwe** Aug 2017-Sep 2018

Position: Clerk

- Assisted in design and installation of internet banking software
- Provided help, advise and training on internet banking manuals and materials
- Created individual and corporate clients' internet banking profiles
- General administrative work, scanning and document imaging

Organization: **ZIBAWU, Harare, Zimbabwe** Jan 2015-Dec 2015

Position: Research and Policy Intern

- Human rights research on workers conditions
- Preparation of policy briefs and newsletters
- Performed legal research including data collection and analysis
- Political analysis and advice

SKILLS AND INTERESTS

- **Languages:** Fluent in English and basic proficiency in French
- **Computer Skills:** Microsoft Packages, WordPress, OCR, Social Media, Email, Skype for Business
- **Other Skills:** Great Attention to Detail, Excellent Verbal and Written Communication Skills, Superb Report Writing Skills, Entrepreneurial Skills, Research, Critical Analysis, Time Management

ACHIEVEMENTS

United Nations Office at Geneva

Graduate Study Programme Certificate July-2019

Tony Elumelu Foundation
Entrepreneurship Award Grant March-2019

African Union
African Union Scholarship Aug-2018

Midlands State University
First Class Degree Nov-2016

PUBLICATIONS

- Access to universal modern energy services as a basic human right: A critical analysis https://www.researchgate.net/publication/333273061_Access_to_Universal_Modern_Energy_Services_as_a_Basic_Human_Right_A_Critical_Analysis
- Anti-money laundering and combating of the financing of terrorism: Focus on Zimbabwe https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3046227
- The root causes of bank failures in Zimbabwe since the year 2008 to 2015 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3120898
- **GIZ-PAU Newsletter, May 2019** "Education is one of the most important tools for sustainable development

LEADERSHIP AND CREATIVITY

- Member of the PAUWES Entrepreneurship and Innovation club (present)
- Member of the PAUWES Climate Change and Gender Club (present)
- Member of Student Energy (present)
- Founding member for Heart for the Young Foundation in Harare, Zimbabwe (present)
- Tony Elumelu Foundation Entrepreneur (present)

REFERENCES

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Mr. Peter Gift Mutasa
Secretary General, Zimbabwe Banks and Allied Workers Union
Email: petergiftmutasa@yahoo.com Tel/Cell: +263774 552 816