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Drivers of households' willingness to generate their electricity post amendment of Electricity Regulation Act in South Africa

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Drivers of households' willingness to generate their electricity post amendment of Electricity Regulation Act in South Africa.

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WITS Business School

Thesis presented in partial fulfilment for the degree of Master of Business Administration to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

March 2022

DECLARATION

I, Hlamalani Cordley Hlungwani declare that this research report entitled 'Drivers of households' willingness to generate their electricity post amendment of Electricity Regulation Act in South Africa' is my own unaided work. I have referenced and acknowledged all concepts and ideas sourced elsewhere. I am submitting the report in partial fulfilment of the requirements for the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. No submission has been made for this report before for any degree or examination to any other university.

_____

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Signed at Johannesburg on 31st March 2022

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ABSTRACT

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Supervisor: Dr Nakuze Chalomba

Thesis title: Drivers of households' willingness to generate their electricity post amendment of Electricity Regulation Act in South Africa.

Purpose: Prior to amendment of Electricity Regulation Act in South Africa, which increased the threshold for embedded generation without licencing 1 Megawatt (MW) to 100 MW, one of the factors that was considered to prevent consumers to generate their own electricity was the licencing requirements challenges. The research investigated other drivers that affect the households' willingness to generate their own electricity in South Africa, given the recent amendment to the Electricity Regulation Act which has relaxed those licencing requirements.

Research design, methodology and approach:

The researcher sent questionnaires to various electricity households' consumers, for which 120 respondents were used as a sample to the study, employing a quantitative methodology.

Findings: The study has found that there is a positive relationship between electricity customers willingness to generate own electricity and their environmental concern. The more electricity customers are concerned about the environment the more they will be willing to generate their own electricity. The study also discovered the existence of positive relationship between electricity customers willingness to generate own electricity and the perception of self-effectiveness. The more electricity customers perceive that they are capable of generating their own electricity the more they will be willing to generate their own electricity.

Value: The research can be used to assist in understanding the factors that might be preventing households from generating their own electricity despite the removal of the licencing barriers post amended of the Act. It can also be used to identify areas of focus when providing awareness to residential customers on the importance of electricity generation.

Key words: Perceived benefits, Environmental concern**,** Perceived self-effectiveness

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DEFINITION OF KEY TERMS AND CONCEPTS

Perceived benefits: reduction in carbon emissions, improved energy supply and reduced long term costs.

Environmental concern: the concern about climate change and the damage to the environment.

Perceived self-effectiveness: Customers perception about the capability to generate their own electricity (Irfan et al. 2020).

1 INTRODUCTION TO THE RESEARCH

1.1 BACKGROUND AND CONTEXT

Electricity is of great importance to any economy and is the key input to industrial processes and hence economic growth. Electricity gives consumers modern conveniences, and keeps their lights is for those reasons they complain when there is load shedding as they their lives without electricity seems incomplete.

Electricity consumers in South Africa has been experiencing several rounds of loadshedding in the previous years. The energy challenges in South Africa needed some serious interventions. It was not surprising that on the 10th of June 2021, The President of South African government, His Excellency President Matamela Cyril Ramaphosa in a national address, announced that the government will be amending Schedule Two (2) of the Electricity Regulation Act, 2006 (Act No.4 of 2016) to increase threshold for embedded generation from the current One (1) Megawatt (MW) to 100 MW without the need for National Energy Regulator of South Africa (NERSA) license (Presidency, 2021). “Embedded Generator” is defined as ‘‘legal entity that operates one or more Unit(s) that is connected to the distribution system or desiring to do so’’ (Government Gazette 44989, 2021).

Schedule 2 of the Electricity Regulation Act, 2006 was amended and gazetted on 12 August 2021 by the Minister of Mineral Resources and Energy, Gwede Mantashe after consulting relevant stakeholders including NERSA (Government Gazette 44989, 2021).

The purpose of the amendment is to exempt the generation projects of up to 100 MW in size from the NERSA licensing requirement, whether or not they are connected to the grid. This will remove a significant obstacle to investment in embedded generation projects.

Only embedded generation projects of below 1 MW in size were exempted from complying with NERSA licensing requirement prior to the amendment, in other words, only generation of less than 1 MW was allowed without licencing. That threshold was not motivating for potential electricity generators as it was considered very low given that most industrial electricity consumers used more than 1 MW for their operations given the magnitude of their plants.

The President's announcement has been widely welcomed by stakeholders after continuous load shedding that the country has been facing. This means various stakeholders could be less reliant on Eskom and invest in alternative sources of electricity. The continuous load shedding has always been considered as the threat to the growth of the South African economy which has been ailing for sometimes.

A need to consider alternative energy sources has arisen, and private participation in electricity generation is more required than ever. Some of the potential investors have been reluctant to invest in South Africa due to the unreliability of energy supply as evident by the continuous load shedding, one of the reasons for reluctance was identified as the red tapes associated with stringent regulations on licencing (Renaud, Tyler, Roff, and Steyn, 2020). The increase in the threshold that requires licencing is expected to motivate more embedded generators to participate in the energy industry which has over the years been dominated by Eskom.

Having more embedded generators has potential of easing pressure on Eskom's challenge of keeping up with the demand of electricity, given the additional supply capacity that they will add. It is anticipated that electricity customers may experience minimal to no load shedding as additional capacity may lead into more reliable energy. There is also the possibility that the prices that the consumers pay for electricity may go down as the prices might become more competitive given the potential new generators and providers of electricity. Another benefit that the additional embedded generators will bring is the reduction in the environment emissions, as they are expected to use renewables sources to generate electricity unlike Eskom that is more reliant on Fossils Fuels to generate electricity which are polluting the environment in South Africa.

This research seeks to investigate the drivers of households' willingness to generate their own electricity post amendment of Electricity Regulation Act in South Africa, which increased the threshold for embedded generation without licencing 1 MW to 100 MW. Section 1.1 introduces the concepts used in research conceptualisation. Section 1.2 contains research conceptualisation, this includes the research problem statement, the research purpose statement, and the research questions, as well as the appropriate accompanying research hypotheses. The research conceptualisation section is followed by section 1.3 containing the delimitations and assumptions of the research study. Section 1.4 discusses the significance of the research study, followed by section 1.5 providing a preface of the research report.

1.2 RESEARCH CONCEPTUALISATION

1.2.1 The research problem statement

Regulatory restriction was identified as one the obstacles in the growth of renewable energy in the energy industry (Renaud, Tyler, Roff, and Steyn, 2020). The study also acknowledges generation licencing regulatory restrictions discouraged potential generators on their quest for generating their own electricity (Renaud, Tyler, Roff, and Steyn, 2020). There has always been a need in South Africa to stop relying on Eskom as the main source of energy, thereby allowing more companies to generate electricity whether for their own use or to sell.

Potential generators have been reluctant to venture into the market as they were only limited to generation capacity of 1 MW without having to apply for generation licencing. As it was noted on by Renaud, Tyler, Roff, and Steyn (2020), generation licencing regulatory restrictions discouraged potential generators on their quest for generating their own electricity.

The consumers of electricity in South Africa have been subjected to continuous higher annual increase on electricity rates which has been far above the inflation that is despite the electricity price increases being regulated by

NERSA. The electricity consumers in South Africa have been forced to live with the reality that despite paying higher rates, the electricity can be taken away from them anytime in the form of load shedding.

1.2.2 The research purpose (aim and objectives) statement

The purpose of this research is to investigate the drivers of households' willingness to generate their own electricity post amendment of Electricity Regulation Act in South Africa, which increased the threshold for embedded generation without licencing 1 MW to 100 MW.

The research can be used to assist in understanding the factors that might be preventing households from generating their own electricity despite the removal of the licencing barriers post amended of the Act.

1.2.3 The research questions as well as the appropriate accompanying research hypotheses

1.2.3.1 Question 1:

What is the relationship between perceived benefits of increasing the electricity licencing threshold from 1 MW to 100 MW and residential consumers' willingness to generate their own electricity in South Africa?

1.2.3.1.1 Hypothesis 1 (H1):
There is a positive relationship between perceived benefits i.e., reduction in carbon emissions, improved energy supply and reduced long term costs, and residential customers willingness to generate their own electricity in South Africa.

1.2.3.1.2 Alternative hypothesis

There's no relationship between perceived benefits i.e., reduction in carbon emissions, improved energy supply and reduced long term costs, and residential customers willingness to generate their own electricity in South Africa.

1.2.3.2 Question 2:

What is the relationship between environmental concern and residential customers willingness to generate their own electricity in South Africa?

1.2.3.2.1 **Hypothesis 2 (H2):**

Environmental concern has a positive effect on consumers' willingness to generate their own electricity in South Africa.

1.2.3.2.2 Alternative hypothesis

There is no relationship between environmental concern and residential customers willingness to generate their own electricity in South Africa.

1.2.3.3 Question 3:

What is the relationship between perceived self-effectiveness, i.e., knowledge about alternative sources of energy and resources(income), and residential customers willingness to generate their own electricity in South Africa?

1.2.3.3.1 **Hypothesis 3 (H3):**

There is a positive relationship between perceived self-effectiveness, i.e., knowledge about alternative sources of energy and resources, and residential customers willingness to generate their own electricityin South Africa

1.2.3.3.2 Alternative hypothesis

There is no relationship between perceived self-effectiveness, i.e., knowledge about alternative sources of energy and resources, and residential customers willingness to generate their own electricity in South Africa.

1.3 DELIMITATIONS AND ASSUMPTIONS OF THE RESEARCH STUDY

1.3.1 Delimitations

The research study focussed on the impact that the increase in electricity licencing threshold from 1 MW to 100 MW would have on price and reliability of electricity, and the participants of the research study were limited to the residential electricity customers.

1.3.2 Assumptions

The assumption made on the research study is that the participants will complete the questionnaire truthfully and that they will have sufficient data bundles to complete the questionnaire on time. Another assumption is that the existing embedded generators and the potential generators that will enter the energy industry as a result of increased in threshold to 100 MW will use renewable energy sources to generate electricity.

1.4 SIGNIFICANCE OF THE RESEARCH STUDY

There has been ongoing debate regarding the impact that the decision to increase the threshold for embedded generation not requiring NERSA licencing to 100 MW, would have in the generators and users of electricity. The study seeks to assess the potential impact of that decision on residential consumers in South Africa. This is due to the expectation that there will be more embedded generators and that other residential customers might be motivated to generate their own electricity due to the increase in the threshold.

Several studies have been done previously regarding the factors that affect the electricity consumers to adopt renewable energy (Irfan et al. ,2020). The studies followed similarly prior studies done by Düştegör et al. (2015) and Mosly & Makki (2018).

Previous studies revealed licensing regulatory restrictions as one of the factors discouraging customers from generating their own electricity in South Africa (Renaud, Tyler, Roff & Steyn, 2020). Electricity Regulation Act in South Africa has been amended in 2021, and it has increased the threshold on which customers may generate electricity without licensing. No studies have been done to identify the factors that may influence residential consumers' willingness to generate their own electricity, after removing one of the obstacles which was discouraging them to do so.

The study seeks to identify the factors that may influence residential consumers' willingness to generate their own electricity now that the Electricity Regulation Act in South Africa has been amended.

The research findings can be used to identify areas of focus when providing awareness to residential customers on the importance of electricity generation. The research findings might assist residential electricity consumers in South Africa in understanding the factors that influence residential consumers' willingness to generate their own electricity in South Africa, after amendment of Electricity Regulation Act in South Africa which increased the threshold for embedded generation without licencing 1 MW to 100 MW.

1.5 PREFACE TO THE RESEARCH REPORT

The research report will consist of five chapters. Chapter 1 covered what prompted the research. It outlined the research problem statement, research purpose statement, research questions as well as the research hypotheses. Chapter 2 provides a literature review. It covers the research problem analysis, research knowledge-gap analysis, the explanatory framework, and the conceptual framework; generally past studies and a summary of literature reviewed. Chapter 3 discusses the research strategy, design, procedures, reliability, and validity. measures as well as limitations. Chapter 4 presents the research results. Chapter 5 and discusses the research findings. Chapter 6 presents the summary, conclusion, limitations, and recommendations

2 LITERATURE REVIEW

2.1 INTRODUCTION

The key objective of this chapter is understanding of the research problem, reviewing the literature, and developing of a framework to be used in interpreting the research findings. The chapter is subdivided into five sections, starting with section 2.1 detailing the research problem. Section 2.2 which contains the reviewing of the literature on previous related studies, is followed by section. Section 2.3 is detailing the quantitative variables that are key to this research, while section 2.4 is providing a review of study variables and hypotheses development.

2.2 RESEARCH PROBLEM ANALYSIS

2.2.1 Consequences of the problem

Electricity customers in South Africa has been suffering for the last few years, with having to leave with the reality that electricity can be taken away from them with short notice or without notice at all. The suffering has been as a result of Eskom's implementation of load shedding, which keep electricity consumers in the dark. Load shedding is when the available energy capacity is rotated between all Eskom customers during the period where the demand is greater than the supply, the power cuts are done in a controlled and scheduled manner to avoid blackouts (Eskom Integrated Report, 2020).

Eskom reported that they implemented load shedding for 46 days in their 2020 financial year, which is a period starting from 1 April 2019 to 31 March 2020 (Eskom Integrated Report, 2020). The above paints a gloomy picture which is not likely to bring hope to the electricity consumers that one day they will have reliable electricity.

Despite Eskom assertion that they are not able to recover their costs of producing electricity as the company is charging its customers lower prices (Eskom Integrated Report, 2020), customers are still complaining about the growing electricity costs. The electricity costs have been growing over the past few years, with annual escalation most often above the Consumer Price Index (CPI), which continues to affect the customers' pockets in a negative way.

Another challenge is the negative environmental impact that Eskom has to the country through generation of electricity. This is due to the fact that Eskom is mainly using fossils fuels to generate electricity which is damaging the environment through the release of carbon emissions. According to Eskom Integrated Report (2020), there has been no signs for improvement in particulate emission over the past few years, and for 2020 financial year Eskom reported its worst performance as far as articulate emission is concerned since its 2007 financial year.

The consumers of electricity in South Africa have been subjected to continuous higher annual increase on electricity rates which has been far above the inflation that is despite the electricity price increases being regulated by NERSA. The electricity consumers in South Africa have been forced to live with the reality that despite paying higher rates, the electricity can be taken away from them anytime in the form of load shedding.

2.2.2 Causes of the problem

As it was reported in Eskom Integrated Report (2020), of the electricity consumed in South Africa, 90% is supplied by Eskom. The continuous reliance in Eskom is a problem as, the failure of Eskom is the failure to the whole country. It is not surprising that the electricity consumers have been suffering from the load shedding as Eskom has been unable to keep up with the demand.

One of the main challenges that Eskom has been facing in the past few years is its aging infrastructure which has a reason of being poorly maintained, as Eskom has been postponing the maintenance in some of the plants in order to keep the lights on at all costs. The effect of those past poor decisions is the one that that are playing out now, and unfortunately the customers has to suffer as a result. According to Eskom Integrated report (2020), and as shown in figure 1, under Chapter 2.2.2 above, Eskom's system's performance worsened in 2020.

Regulatory restrictions were identified as one the obstacles in the growth of renewable energy in the energy industry (Renaud, Tyler, Roff & Steyn, 2020). The study also acknowledged that generation licencing regulatory restrictions discouraged potential generators on their quest for generating their own electricity (Renaud, Tyler, Roff & Steyn, 2020). Many potential generators have been discouraged by the lower threshold which did not require licencing, so it did not make economy hence to invest in electricity generation, which was going to assist in increasing generation capacity and in turn, reduce load shedding.

One of the most common ways for residential consumers to generate electricity has been considered to be renewable energy. There has been however a slow progress in getting more customers to invest in renewable energy which was going to reduce capacity pressure on Eskom. A slow progress may be attributed to the high costs associated with renewable energy given that it is require lot of capital as observed by Irfan et al. (2019).

2.2.3 Possible solution

One of the possible solutions to the electricity customers is to generate their own electricity and reduce or stop reliance on Eskom, given Eskom continuous' struggle to provide reliable electricity. Customers are likely to use renewable energy as environment friendly alternative source of energy industry (Renaud, Tyler, Roff & Steyn, 2020). Given that there has been resistance and slow movement in getting customers to generate their own electricity by considering

other sources of energy with one of the reasons being the licencing requirements from NERSA, one would expect the customers to consider generation given the amendment of the Electricity Regulation Act in South Africa which increased the threshold for embedded generation without licencing 1 MW to 100 MW. It is for that reason that the researcher seeks to investigate the factors that may play a hand in influencing residential consumers' willingness to generate their own electricity in South Africa.

2.3 RESEARCH KNOWLEDGE GAP ANALYSIS

Several studies have been done regarding the factors that affect the electricity consumers to adopt renewable energy (Irfan et al. ,2020). The revelations suggest that electricity customers will be inclined to generate their own electricity if they believe it will benefit their cause, and they will use renewable energy as a source of their electricity.

The studies done followed similarly prior studies done by Düştegör et al. (2015) and Mosly & Makki (2018) which also looked at the factors that affect the electricity consumers to adopt renewable energy. Previous studies revealed licensing regulatory restrictions as one of the factors discouraging customers from generating their own electricity in South Africa (Renaud, Tyler, Roff & Steyn, 2020).

Electricity Regulation Act in South Africa has been amended in 2021, and it has increased the threshold on which customers may generate electricity without licensing. No studies have been done to identify the factors that may influence residential consumers' willingness to generate their own electricity, after removing one of the obstacles which was discouraging them to do so.

The study seeks to identify the factors that may influence residential consumers' willingness to generate their own electricity now that the Electricity Regulation Act in South Africa has been amended.

The research findings can be used to identify areas of focus when providing awareness to residential customers on the importance of electricity generation.

2.4 VARIABLES THAT ARE KEY TO THE RESEARCH

2.4.1 Perceived benefits

Perceived benefits i.e., reduction in carbon emissions, improved energy supply and reduced long term costs.

2.4.2 Environmental concern

The concern about climate change and the damage to the environment.

2.4.3 Perceived self-effectiveness

That is knowledge about alternative sources of energy and resources.

2.5 REVIEW OF STUDY VARIABLES AND HYPOTHESES DEVELOPMENT

The following is the review of the study variables and the hypothesis development for this research study:

2.5.1 Perceived benefits

The increase in consumers' willingness to accept the renewable energy is positively associated with their perception about the benefits the renewable energy offer (Hansla et al. 2008). The observations by Hansla et al. (2008), is aligned to the previous observations by Bang et al. (2000). The electricity consumers might be encouraged to invest on renewable energy and generate their own electricity if they anticipate that there will be benefits in doing so. The benefits include reduction in carbon emissions and reduced electricity costs.

Hypothesis 1: There is a positive relationship between perceived benefits i.e., reduction in carbon emissions, improved energy supply and reduced long term costs, and residential customers willingness to generate their own electricity in South Africa.

2.5.2 Environmental concern

Environmental concern is defined as the level to which households have knowledge about environmental dilemmas and are committed to solving them. Globally, consumers are becoming aware of their daily consumption routines, and the level to which the environment is being affected by these activities (Canova et al. 2020). Climate changes and the growing concern on environmental damage has been the ongoing topic in the political and economic space recently (Grafakos et al. 2020). It goes without saying that many people are becoming concerned about the health and continuous damage to their environment.

Hypothesis 2: Environmental concern of residential electricity customers has a positive effect on their willingness to generate their own electricity in South Africa.

2.5.3 Perceived self-effectiveness

Customers are influenced by Perception of self-effectiveness (PSE) in their decision making, which is whether they are capable of doing something or not (Irfan et al. 2020). PSE is considered influential to the customer's energy usage intention in a positive way (Ham et al. 2015). As it was highlighted by Korcaj et al. (2015), customers needed necessary resources to adopt and use renewable energy.

Hypothesis 3: There is a positive relationship between perceived self-effectiveness, i.e., knowledge about alternative sources of energy and resources, and residential customers willingness to generate their own electricity in South Africa.

2.6 THEORETICAL FRAMEWORK

This section contains a discussion of the management theories used in this research study. Two management theories were considered and adopted for the study theoretical framework's establishment, which are the Theory of Planned Behaviour (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT).

According to TPB, the individual's behaviour is determined by his/her behavioural intention (Ajzen 1991). Individuals consider the consequences associated with the behaviour prior to them behaving in a particular manner (Ajzen 1991). TPB theory has been widely used to examine and predict the behaviour of consumers (McBride et al. 2020). This theory is more relevant to the study as customers' behaviours concerning whether to generate their own electricity or not will depend on what they perceive as the associated consequences (benefits).

UTAUT which is the second theory used for the study is very useful for behavioural research (Venkatesh et al.,2003). The theory was developed using 8 different models and it provide a new perspective of intention and behavioural determinants (Venkatesh et al.,2003). The theory is more applicable to the study as consumer's behaviour with regard to willingness to generate their own electricity is being examined.

2.7 CONCEPTUAL MODEL

The following Figure 1, present the Conceptual model of the hypotheses that the study seeks to prove which are:

H1: There is a positive relationship between Willingness to generate own electricity and the perceived benefits.
That will be proven by asking the participants 5 questions that are related to the perceived benefits using 5-scale options.

H2: There is a positive relationship between Willingness to generate own electricity and the environmental concern.

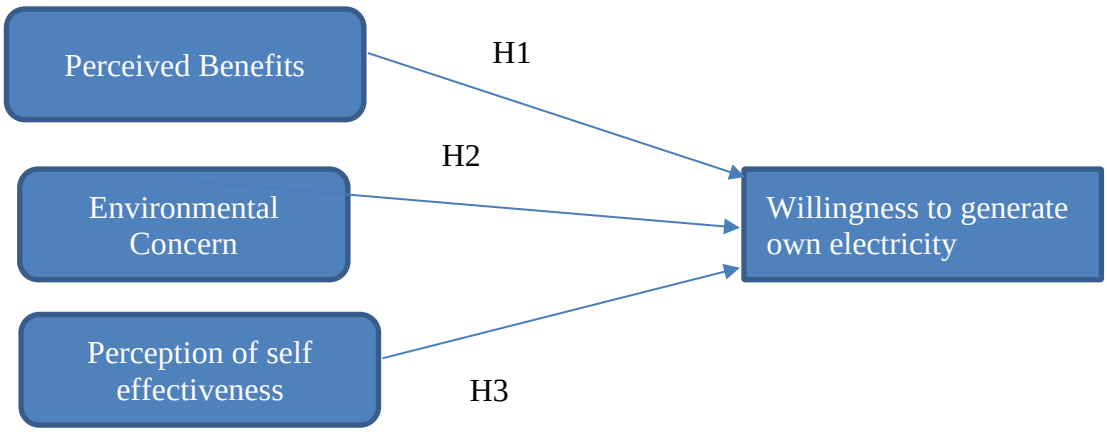
That will be proven by asking the participants 5 questions that are related to the environmental concern using 5-scale options.

H3. There is a positive relationship between Willingness to generate own electricity and the perception of Self-Effectiveness.

That will be proven by asking the participants 5 questions that are related to the self-effectiveness using 5-scale options.

The below illustrate the 3 primary drivers of willingness to generate own electricity.

Figure 1: Conceptual model



H1- Hypothesis 1
H2- Hypothesis 2
H3- Hypothesis 3

3 RESEARCH STRATEGY, DESIGN, PROCEDURE AND METHODS

3.1 INTRODUCTION

The key objective of this chapter is to outline the research strategy, followed by research design. The following section outlines well the procedure and methods utilised in this research to collect, process, and analyse empirical evidence. The section further on outlines measurement scales, which is followed by detailing the reliability and validity measures that were applied to ensure credibility. The chapter concludes by outlining the weakness.

3.2 RESEARCH STRATEGY

According to Alverson & Skoldberg (2000), there are two types of methodologies, Quantitative methodology and qualitative methodology are the two types of research methodology. The questions that the research seeks to address together with the research purpose should influence the choice on which methodology to use (Merriam, 2009).

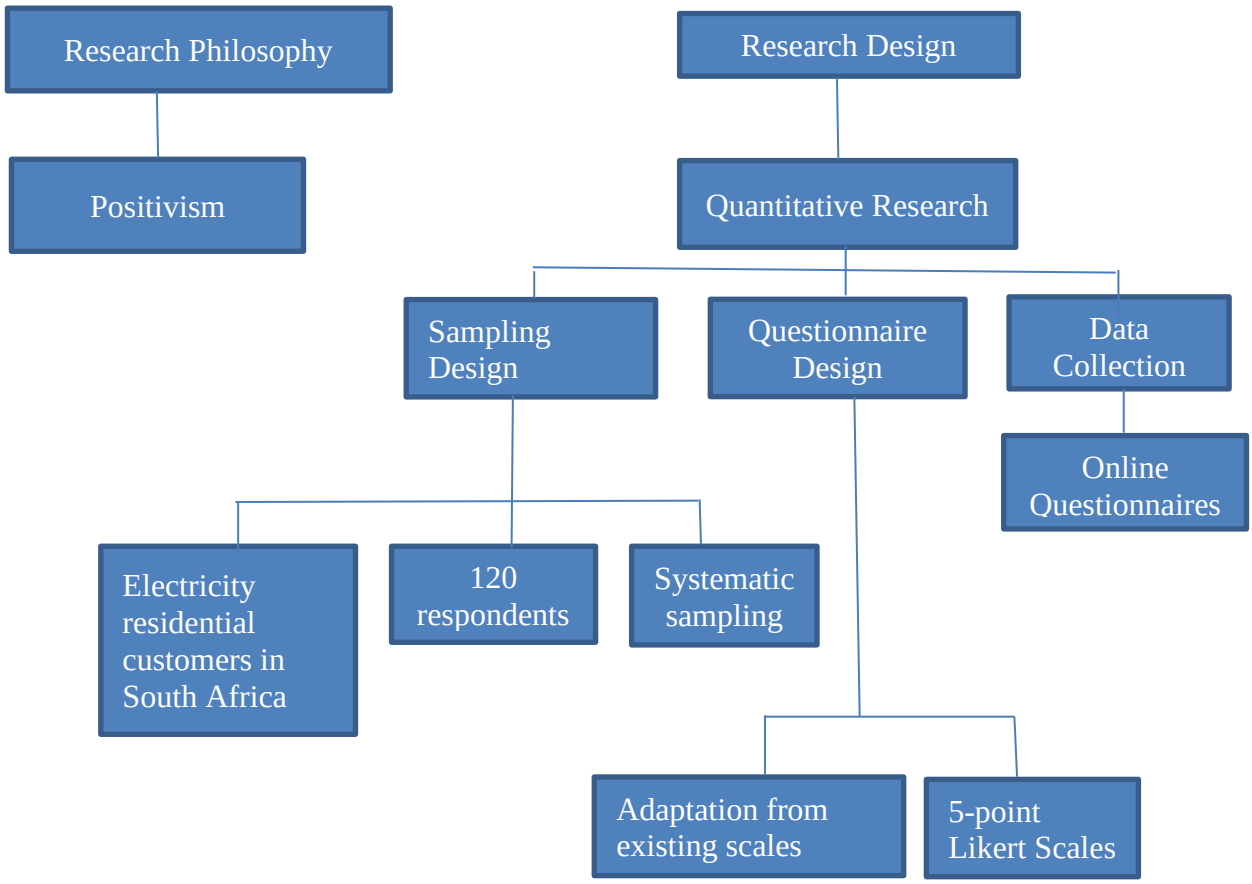
The quantitative research methodology uses questionnaires, surveys, or experiments in data collection (Hittleman and Simon, 1997). Quantitative research method has been used for this research study as it will assist in addressing the research questions and serves the research purpose.

Quantitative methodology has been widely used for studies on people's behaviour (Tanner and Wölfing Kast 2003), this supports the use of Quantitative methodology on the study as it is focuses on the customers willingness to generate their own electricity. The use of Quantitative methodology for this study is also consistent to (M. Yazdanpanah et al. 2015) who used it on their study to 'Investigate public acceptance and willingness to use renewable energy sources in Iran'.

Another reason that supports the use of quantitative research methodology for this research is that the study used the statistics in explaining the results and the literature in hypotheses development and is consistent with Gilbert (2001).

3.3 RESEARCH DESIGN

According to Bell, Bryman and Harley (2018) the research design is the of a research's overall plan for which the research study components are integrated logically. According to Bryman (2012), one of the five generic research designs is survey). The survey anonymity allows the research participants opportunity to honestly answer the questionnaire. The Figure below presents the research design that is adopted for the research study.



Source: Compiled by researcher (2022)

3.3.1 Research Approach

Given that that the study research will result in bigger size of respondents, quantitative approach was applied, according to McDaniel & Gates (2006) that is the method which is effective when dealing with high number of respondents. This is due to the fact that numerical data collection methods are applied in the quantitative approach (Rutberg and Bouikidis,2018).

3.3.2 Research Philosophy

The Positivist Paradigm, which is one of the several research philosophies, was selected and employed in the research study. It suitable for this study as numerical data was used and presented using graphs. The above is aligned with the assertion by Saunders et al. (2015) that Numerical data are utilised to create a view during research when employing Positivist Paradigm, and the information is presented through graphs and charts. Given that the research study seeks to investigate the relationship between the independent and dependent variables, Positivist Paradigm is the most suitable philosophy in that regard.

3.4 RESEARCH PROCEDURE AND METHODS

This section documents the actual procedure and methods to be used in this study by outlining the research data collection instruments, followed by the targeted population and respondents sampling section. It further outlines the ethical considerations during collection of research data, data collection process and storage. The section further provides research data and information processing and analysis. It concludes describing the research respondents.

3.4.1 Research data collection instrument

The questionnaires will be used as data collection instrument for the research study. That is due to the fact that quantitative data will be collected for the study, and it is supported by the assertion made by Kumar (2014) regarding the questionnaire as an instrument used for quantitative data collection. One of the advantages of the questionnaires usage in data collection is their assistance in providing responses quicker and cost effectiveness (Kumar, 2014), hence they are the most preferred for this research study.

3.4.2 Research target population and sampling of respondents

The research target population is residential electricity consumers in South Africa both males and females, for the age group of between 20 and 65 years. The selected group is considered as the direct residential electricity consumers. The target population represents the entire group of interest as it could difficult and challenging to do the research to the entire group, given the bigger size of the group (Lee,2015). The expected costs and time required was considered in determining the above, as recommended by Lee (2015).

Given the challenges associated with the magnitude of the target population, it was very necessary to consider how the sampling needed to be carried out on the respondents. Bell, Bryman and Harley (2015) regard sampling as the statistical process whereby a subset of population of interest is selected for observations and reaching conclusion about that population.

It was very crucial that sample size was determined appropriately as failure to so would have resulted in unreliable results. Given that Structural Equation Modelling (SEM) was employed, a sample of 120 participants was selected, this is aligned with Grotzinger *et al*., (2019) who regard a sample of less than 100 as small with a risk of providing unreliable results. The sample of 120 was therefore justifiable, as the costs and time implication needed to be considered,

as asserted by Bryman & Bell (2003) that, it is of the utmost importance to consider the costs and time implication when making a size sample selection.

3.4.3 Ethical considerations when collecting research data

The research will request for permission and approval from University of Witwatersrand Ethics Committee prior starting with data collection. It is crucial to get the ethics clearance given that the research will require human participants that will go a long way in assisting the researcher to comply to ethical regulations of conducting research. The research is conducted for the academic purpose only, which is for the researcher's completion of Master in Business Administration, and as such there is no conflict of interest which has a potential of affecting the researcher's ethical conduct negatively. The researcher undertakes to respect the research participants' anonymity and information confidentiality, and as such the collected data will be kept in devices which are passwords protected, and the collected data will be destroyed on research completion.

3.4.4 Research data collection process

Qualtrics online survey with the questionnaire which is internet-based tool will be used to collect research data. The questionnaire link will be sent to the research participants through email or WhatsApp. The participants will be able to complete the questionnaire wherever they will be as long as their devices are connected to the internet.

After completion of the questionnaires, the participants will be able to click the 'submit' button as the last step on their side. It is after the participants have successfully submitted the questionnaires that the research will be able to access the collected and stored data on the personal computer which is password protected. The accessibility of the stored data will be limited to the researcher for ethical and security reasons.

3.4.5 Research data and information processing and analysis

The collected data will be evaluated through the statistical techniques, and SPSS programme will be used to analyse the collected data. The gathered information will be captured on Excel spreadsheet prior to being processed on SPSS.

The researcher employed Structural Equation Modelling (SEM) in analysing the collected data, the results of the hypotheses with correlating path coefficients. SEM is useful when there are relationships of complex in nature between the indirect and indirect variables under observation (Stein, Morris & Nock 2012). The research study was expected to result in more complex relations between various variables under observation requiring analysis, hence it was justifiable to employ SEM. Another justification of employing SEM in this research study, is the efficiency that it provides ensuring that accurate outcome is realised (Steenkamp and Baumgartner 2000).

3.4.6 Description of the research respondents

The targeted research participants are the residential electricity consumers in South Africa both male and female. The targeted population age group is between 20 and 65 years old who are expected to be the direct residential electricity consumers. The research participants will be situated in various provinces across South Africa given that there will be no boundaries in access as the research will be done online. It should be noted however that most research participants are expected to come from Gauteng province given that the researcher works, study and reside in Gauteng and the questionnaire will also be sent to colleagues, fellow students, and the participants around where the researcher resides.

It is anticipated that the participants will possess a minimum education at matric level and that they understand English given that the questionnaire will be in that language. The ethnicity of the participants is not a considered a factor for

this research study given than the electricity experience of the residential electricity customers cannot isolated to a specific ethical group.

3.5 RESEARCH STRENGTH: RELIABILITY AND VALIDITY MEASURES APPLIED

3.5.1 Reliability

Research reliability refers to the consistency and stability of the results produced by the research method, it further refers to how stable and consistent the measure that is used in research (Koval, 2016). SEM was used to measure test the reliability of the measurement instrument used, by employing the average value extracted (AVE), the composite reliability (CR) and the Cronbach alpha coefficient.

AVE which estimates the indicators' overall variances, is said to be having reliable construct if the estimate is above 0.5 (Nusair & Hua,2010), while a minimum of 0.4 which is the suggested minimum AVE estimate for the construct to be reliable according to Fraering & Minor (2006). The CR index of at least 0.7 is acceptable in determining the measurement instrument reliability (Hair et al., 2009). With regard to Cronbach alpha, the general rule is that a minimum of 0.7 Cronbach alpha coefficient is accepted as reliable (Hair et al., 2009).

3.5.2 Validity

Research validity can be referred to how close is the score to the measure it represents and how accurate the concept is being measured in the quantitative study valid (Koval, 2016). Confirmatory Factor Analysis (CFA) were applied for each SEM scale to test validity, that includes Factor Loading which test Convergent validity, Correlation Matrix, and the Average Value Extracted (AVE) and Shared Value (SV) which test Discriminant validity. CFA is widely used where there is need for hypotheses confirmation on the relationship between measurement item and its factors (Netemeyer, Bearden & Sharma, 2003).

3.6 MEASUREMENT SCALES

For the purpose of the research study, the questionnaire was measured using 5-point Likert-scale starting from 1 representing Strongly Disagree to 5 representing Strongly Agree. According to Miller & Brewer (2003), the scales are commonly used when one tests attitudes, behaviours, and perceptions. They will be useful for the purpose of this research study as it allows a wider range of options to choose on the surveys, which will increase the chances of accurate answering of the questions by the participants. Appendix B illustrates the questionnaire sent out to the participants for this study.

3.7 RESEARCH WEAKNESSES/ LIMITATIONS

There is a possibility that not all expected participants might respond on time due to the availability of their time or internet access/ data bundles.

4 PRESENTATION AND ANALYSIS OF RESEARCH DATA

4.1 Introduction

Chapter 4 provides insight into the statistical analysis of collected data on the drivers of households' willingness to generate their own electricity. The analysis includes the participants 'demographics, measurement instruments' assessments, Structural Equation Modelling, Path Modelling and Hypotheses Testing and Results.

4.2 Descriptive statistics

This section provides an overview of the Geographic and demographic profiles of the participants which is their age and the provinces they reside in.

4.2.1 Demographic Profile of Respondents

Given that the research study was targeting the residential electricity customers in South Africa, mainly in Gauteng Province the invitation to participate in the survey was extended to all residential electricity customers in South Africa.

There were 120 participants on the study for which 85% came from Gauteng Province as indicated in Figure 1 below which is aligned to the expectation. The 15% is spread among the other province, and there is only Free State Province where there was no participant in the study.

Figure 2: Province

Province

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Eastern Cape	2	1.7	1.7	1.7
	Gauteng	102	85.0	85.0	86.7
	Kwazulu-Natal	1	.8	.8	87.5
	Limpopo	6	5.0	5.0	92.5
	Mpumalang	4	3.3	3.3	95.8
	Northern Cape	1	.8	.8	96.7
	North West	1	.8	.8	97.5
	Western Cape	3	2.5	2.5	100.0
	Total	120	100.0	100.0	

4.2.2 Demographic Profile of Respondents

The age of the participants ranged from 18 to 64 which is considered, and the analysis shows that 55% of those participants age between 35 and 44 years as outlined in Figures 2 and 3 below.

Figure 3: Age Group Distribution

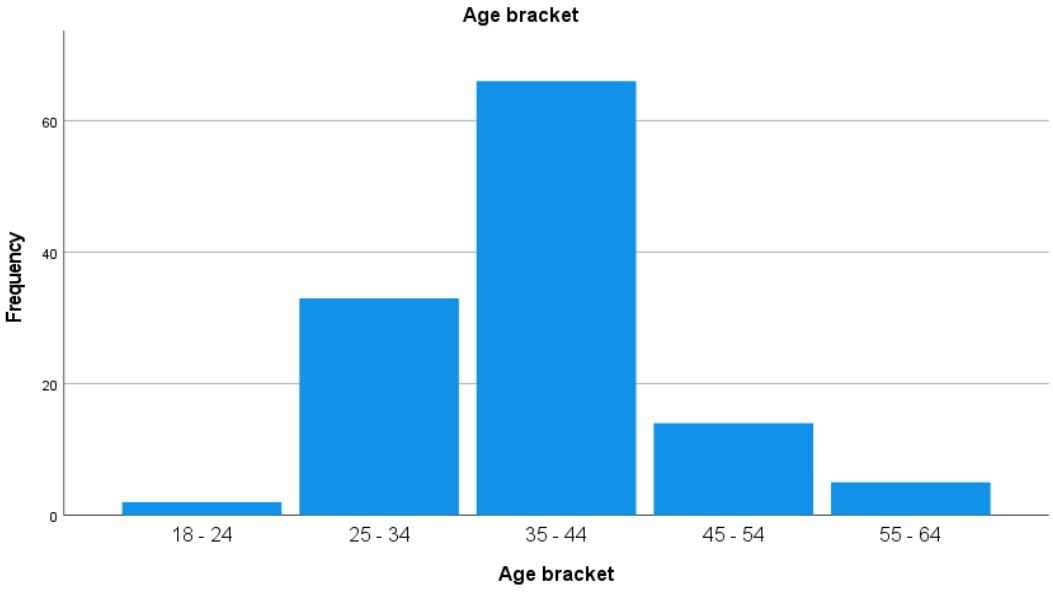


Figure 4: Age Group

Age bracket

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 24	2	1.7	1.7	1.7
	25 - 34	33	27.5	27.5	29.2
	35 - 44	66	55.0	55.0	84.2
	45 - 54	14	11.7	11.7	95.8
	55 - 64	5	4.2	4.2	100.0
	Total	120	100.0	100.0	

4.3 Questionnaire Results

The 5-point Likert scale was used to measure the research constructs of those 120 research study respondents. Four research constructs were measured which are Perceived Benefits (PB), Environment Concern (EC), Willingness to generate own electricity (WSE) and Self-Effectiveness (SI).

The first construct ‘PB’ was measured with Five items ranging from PB1 to PB5. The second construct ‘EC” was measured with Four items, ranging from EC1 to EC4. The third construct ‘WSE’ and fourth construct ‘SE’ were both measured with Three items ranging from WSE1 to WSE3 and SI1 to SI3 respectively. The measurement instruments used have been assessed in the next section.

4.4 Measurement Instrument Assessment

Table 1 below present the results of analysis of the research constructs measurements and will be followed by analysis and discussion of reliability and validity of the instruments used.

Table 1: Accuracy Analysis Statistics

Research Construct		Descriptive Statistics				Cronbach's Test		CR Value	AVE Value		Factor Loading
		Mean Value		Standard Deviation		Item-total	a value			Highest Shared Variance	
PB	PB1	4.31	4.272	0.994	1.020	0.809	0.829	0.838	0.509	0.055	0.696
	PB2	4.42		0.913		0.771					0.790
	PB3	4.32		0.917		0.804					0.667
	PB4	4.28		1.055		0.772					0.743
	PB5	4.03		1.219		0.816					0.663
EC	EC1	3.93	4.070	1.106	1.098	0.837	0.900	0.905	0.709	0.127	0.959
	EC2	4.01		1.119		0.836					0.956
	EC3	4.05		1.144		0.878					0.780
	EC4	4.29		1.024		0.923					0.627
WSE	WPSE1	2.78	2.580	1.547	1.458	0.694	0.827	0.833	0.627	0.237	0.863
	WSE2	2.74		1.498		0.732					0.829
	WSE3	2.22		1.330		0.838					0.671
SI	SI1	4.15	4.120	1.097	1.070	0.505	0.716	0.743	0.509	0.402	0.862
	SI2	4.40		0.965		0.568					0.431
	SI3	3.81		1.147		0.789					0.773

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.4.1 Reliability Testing

In testing the reliability of the measurement instrument used, the average value extracted (AVE), the composite reliability (CR) and the Cronbach alpha coefficient were used. The results of the tests are discussed below

4.4.1.1 Average Value Extracted (AVE)

According to Table 2 below, Average Value Extracted (AVE) which estimates the indicators' overall variances amounts ranged from 0.509 to 0.709. The results reflect the reliability scale levels which are acceptable as all AVE estimates are above 0.5, which is consistent the recommended minimum AVE (Nusair & Hua,2010). The reliability of the scale is further strengthened by the

fact that the AVE estimates are all above 0.4 which is the suggested minimum AVE estimate for the construct to be reliable (Fraering & Minor, 2006).

Table 2: Average Value Extracted (AVE)

			Estimate	λyi^2	$\sum\lambda yi^2$	$\dot{e}i$	$\sum\dot{e}i$	$\sum\lambda yi^2 / (\sum\lambda yi^2 + \sum\dot{e}i)$
	<---	PB1	0.696	0.484		0.516		
	<---	PB2	0.790	0.624		0.376		
	<---	PB3	0.667	0.445	2.545	0.555	2.455	0.509
PB	<---	PB4	0.743	0.552		0.448		
	<---	PB5	0.663	0.440		0.560		
	<---	EC1	0.959	0.920		0.080		
EC	<---	EC2	0.956	0.914	2.835	0.086	1.165	0.709
	<---	EC3	0.780	0.608		0.392		
	<---	EC4	0.627	0.393		0.607		
	<---	WPSE1	0.863	0.745		0.255		
WSE	<---	WSE2	0.829	0.687	1.882	0.313	1.118	0.627
	<---	WSE3	0.671	0.450		0.550		
	<---	SI1	0.862	0.743		0.257		
SI	<---	SI2	0.431	0.186	1.526	0.814	1.474	0.509
	<---	SI3	0.773	0.598		0.402		

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.4.1.2 Composite Reliability (CR)

Composite Reliability (CR) index was used to test the reliability of the measurement instruments. The CR index of at least 0.7 is acceptable in determining the measurement instrument reliability (Hair et al., 2009). The results of CR as outlined on Table 3 below show the CR of between 0.743 and 0.905 which confirms that the measurement instrument used is reliable.

Table 3: Composite Reliability Estimates

				Composite reliability (CR)			
			Loading Factor Estimate	(∑λYi)²	Summation of error terms		**CR**
					εi	∑εi	
PB	<---	PB1	0.696	12.666	0.516	2.455	0.838
	<---	PB2	0.790		0.376		
	<---	PB3	0.667		0.555		
	<---	PB4	0.743		0.448		
	<---	PB5	0.663		0.560		
EC	<---	EC1	0.959	11.036	0.080	1.165	0.905
	<---	EC2	0.956		0.086		
	<---	EC3	0.780		0.392		
	<---	EC4	0.627		0.607		
WSE	<---	WSE1	0.863	5.584	0.255	1.118	0.833
	<---	WSE2	0.829		0.313		
	<---	WSE3	0.671		0.550		
SI	<---	SI1	0.862	4.268	0.257	1.474	0.743
	<---	SI2	0.431		0.814		
	<---	SI3	0.773		0.402		

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.4.1.3 The Cronbach alpha coefficient

In testing the measurement instrument reliability to each variable, the standardised Cronbach alpha coefficient was used. The results are aligned to the general rule that deems a minimum of 0.7 Cronbach alpha coefficient as reliable (Hair et al., 2009). The Cronbach alpha coefficient values ranged between 0.716 to 0.900 as outlined on Table 1 and Appendix A with Perception of Self-Effectiveness and Environmental Concern being the minimum and maximum respectively, confirming that all variables are reliable in the measurement instrument as they are all above 0.7.

4.4.2 Validity Testing

In testing the validity of the measurement instrument used, Factor Loading which test Convergent validity, Correlation Matrix, and the Average Value Extracted (AVE) and Shared Value (SV) which test Discriminant validity were utilised.

4.4.2.1 Convergent validity

As outlined by Carlson & Herdman (2012), Convergent validity is the degree of capturing the same construct using two varying measures. Deviation of values from 1 represents weaker convergent validity indicating the possibility of issues within the two measurement constructs correspondence (Carlson & Herdman, 2012). The Factor loading estimates should be as closely as possible to 1, Schwab (2006) recommended the Factor loading estimates value to be higher than 0.5 for it to be acceptable. According to the test results as outlined on the Table 4 below, fourteen out fifteen items yielded the Factor loading estimates above items, with only One item yielding 0.431. The results confirm the validity of the measurement.

Table 4: Factor Loading Estimates

Research Construct			Estimate
PB5	<---	Perceived benefits	0,663
PB4	<---	Perceived benefits	0,743
PB3	<---	Perceived benefits	0,667
EC4	<---	Environment Concern	0,627
EC3	<---	Environment Concern	0,780
EC2	<---	Environment Concern	0,956
WSE3	<---	Willingness to generate own electricity	0,671
WSE2	<---	Willingness to generate own electricity	0,829
WPSE1	<---	Willingness to generate own electricity	0,863
PB2	<---	Perceived benefits	0,790
PB1	<---	Perceived benefits	0,696
EC1	<---	Environment Concern	0,959
SI3	<---	Perception of Self-Effectiveness	0,773
SI2	<---	Perception of Self-Effectiveness	0,431
SI1	<---	Perception of Self-Effectiveness	0,862

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.4.2.2 Discriminant validity

Correlation Matrix

To assess the constructs' distinctness from each other, the inter-construct correlation matrix was used, that distinctness is an indication of discriminant validity (Engellant, Holland & Piper, 2019). Discriminant validity is highlighted by the differences. One must focus on values that deviate from 1 to realise the high discriminant validity (O'Rourke & Hatcher, 2013). Discriminant validity is evident on the results presented on Table 5 as all the inter-correlation values are less, which makes one conclude that all the correlations determined are are significant.

Table 5: Correlation Matrix

	EC	WSE	SI	PB
EC	1			
WSE	0.262	1		
SI	0.231	0.487	1	
PB	0.357	0.235	0.634	1

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

Average Value Extracted (AVE) and Shared Value (SV)

Discriminant validity was also tested using AVE and Highest Shared Variance (HSV) on Table 6, with a higher AVE compared HSV representing the existence of discriminant validity (Nusair & Hua, 2010).

Table 6: Highest Shared Variance (HSV)

	EC	WSE	SI	PB
EC	1			
WSE	0,069	1		
SI	0,053	0,237	1	
PB	0,127	0,055	0,402	1

Discriminant validity is evident as presented on Table 7 (below), given that all the Research constructs' AVE are higher than corresponding HSV's values.

Table 7: Average Value Extracted (AVE) and Highest Shared Variance (HSV)

Research Construct		AVE Value	Highest Shared Variance
PB	PB1 PB2 PB3 PB4 PB5	0.509	0.055
EC	EC1 EC2 EC3 EC4	0.709	0.127
WSE	WPSE1 WSE2 WSE3	0.627	0.237
SI	SI1 SI2 SI3	0.509	0.402

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.5 Structural Equation Modelling

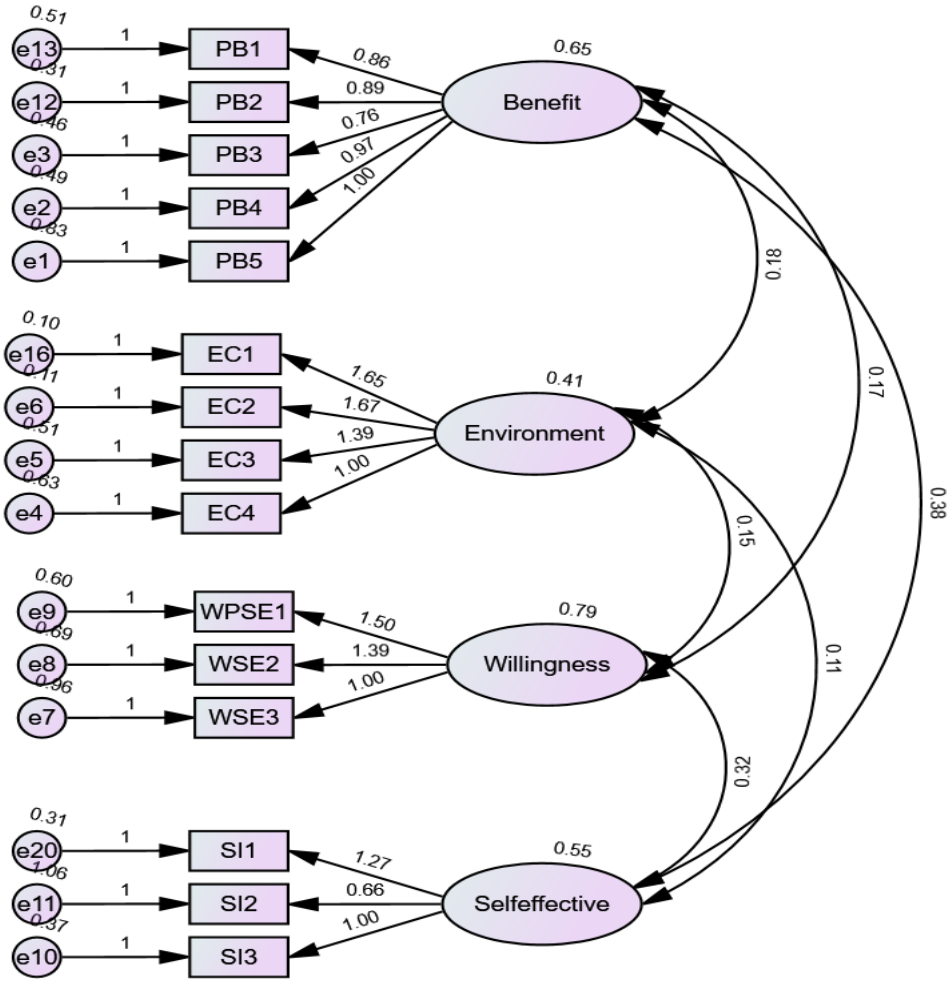
The structural equation modelling (SEM) was used in for the research study data analysis, the model fitness will be discussed bellowed followed by the model fit indices.

4.5.1 Model Fit Assessment

Confirmatory factor analysis (CFA) was deemed appropriately for model fit testing, that was necessary in determining the fitness of the model to the data analysis.

Confirmatory factor analysis

Figure 5: CFA Model



Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.5.2 Model Fit Indices

Various indices have been assessed below to determine the model fitness, namely Chi-square (CMIN), goodness of fit index (GFI), incremental fit index (IFI), the normed fit index (NFI), Root Mean Square Error of Approximation (RMSEA) and Tucker-Lewis Index (TLI).

4.5.2.1 Baseline Comparisons Index

The baseline comparisons indices represent the good model fit as they are all above the recommended level of 0.9 (Tabachnick and Fidell, 2007), as outlined on Table 8.

Table 8: Baseline Comparisons

Baseline Comparisons					
Model	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**
	Delta1	**rho1**	**Delta2**	**rho2**	
Default model	0.918	0.906	0.902	0.953	0.908
Saturated model	1		1		1
Independence model	0	0	0	0	0

4.5.2.2 Chi-square Index

The Chi-square index also support that a good model fit as it is resulted in 2.062 (Table 9, below), which is consistent with the minimum recommended value of 2 (Ullman, 2001).

Table 9: Chi-square Index

CMIN					
Model	**NPAR**	**CMIN**	**DF**	**P**	**CMIN/DF**
Default model	36	173.244	84	.000	2.062
Saturated model	120	.000	0		
Independence model	15	1068.829	105	.000	10.179

4.5.2.3 Root Mean Square Error of Approximation

The root mean square error approximation (RMSEA) is presented below on Table 10, with the RMSEA of 0.064 which acceptable as good model fit.

Table 10: Root Mean Square Error of Approximation

RMSEA				
Model	**RMSEA**	**LO 90**	**HI 90**	**PCLOSE**
Default model	.064	.074	.114	.000
Independence model	.278	.263	.293	.000

4.5.2.4 Goodness-of-Fit-Index (GFI

The Goodness-of-Fit-Index (GFI) is presented below on Table 11, with the RMSEA of 0.929 which acceptable as good model fit as it is a greater than 0.9.

Table 11: Goodness-of-Fit-Index (GFI)

Goodness-of-Fit-Index (GFI)				
Model	**RMR**	**GFI**	**AGFI**	**PGFI**
Default model	.107	.929	.758	.584
Saturated model	.000	1.000		
Independence model	.432	.382	.287	.331

4.6 Path Modelling and Hypotheses Testing

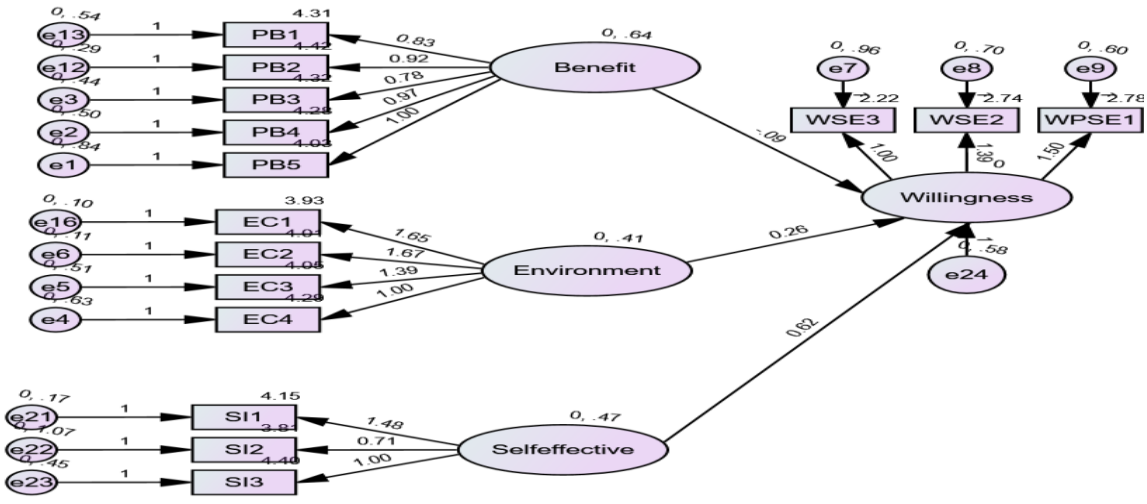
Path modelling has been used analyse the results of the hypotheses with correlating path coefficients as presented in Table 12 below. The p-values are analysed in assessing if hypotheses are supported or not, with 95% hypotheses are presented with three asterisks (***).

Table 12: Hypothesis results and path coefficients

Hypotheses Results						
Path Coefficient			**Hypothesis**	**Estimate**	**P-value**	**Results**
Willingness to generate own electricity	<---	Perceived Benefits	H1	-.087	.422	Not Significant
Willingness to generate own electricity	<---	Environment Concern	H2	.262	.048	Significant and supported
Willingness to generate own electricity	<---	Perception of Self-Effectiveness	H3	.624	***	Significant and supported.

Two out of 3 tested hypotheses (H2 ad H3) were found to be significant and supported, while the other hypothesis (H1) was found to be insignificant.

Figure 6: Conceptual model and path coefficient



Source: Compiled by researcher (2022)

Key:

- PB = Perceived benefits
- EC = Environment Concern
- WSE= Willingness to generate own electricity
- SI = Perception of Self-Effectiveness

4.7 Summary of Hypotheses Results

H1: There is a negative relationship between Willingness to generate own electricity and the perceived benefits.

The path coefficient (-0.087) on Table 12 and Figure 5 above represents a very weak and negative relationship between Willingness to generate own electricity and the perceived benefits. In order words Hypothesis 1(H1) is not supported which suggest that electricity customers' perceptions on the benefits associated with generating own electricity will not influence them to generate their own electricity. It should be noted thought that the relationship between the above variables is not significant.

H2: There is a positive relationship between Willingness to generate own electricity and the environmental concern.

The path coefficient (0.262 on Table 12 and Figure 5 above represents a weak and positive relationship between Willingness to generate own electricity and the environmental concern. In order words Hypothesis 2(H2) is supported which suggest that electricity customers' environmental concern will influence them to generate their own electricity.

H3: There is a positive relationship between Willingness to generate own electricity and the perception of Self-Effectiveness.

The path coefficient 0.624 on Table 12 and Figure 5 above represents a moderate strong and positive relationship between Willingness to generate own electricity and the Perception of Self-Effectiveness. In order words Hypothesis 3 (H3) is supported which suggest that electricity customers' perception of Self-Effectiveness will influence them to generate their own electricity.

4.8 Conclusion

The chapter provided insight into the statistical analysis of collected data on the drivers of households' willingness to generate their own electricity. The measurement instruments were tested for validity and reliability after the s-descriptive analysis, followed by model fit discussion, and concluded by

5 DISCUSSION OF RESEARCH FINDINGS

5.1 INTRODUCTION

The research findings are discussed critically in this chapter, which includes analysing of all hypotheses and contrasting the results to related previous literature, the application of the results and the chapter concludes by summarising the hypotheses results

5.2 WILLINGNESS TO GENERATE ELECTRICITY AND PERCEVED BENEFITS

H1o: There is negative relationship between *Willingness to generate own electricity and perceived benefits.*
H1a: There is a positive relationship between *Willingness to generate own electricity and perceived benefits.*

In this study I found that there is no strong relationship between electricity customers willingness to generate own electricity and the perceived benefits. In order words, the customers perception on the benefits of generating own electricity, does not influence them to generate their own electricity. The is evident on the coefficient (-0.087) on Table 12 and Figure 5, which represents a very weak and negative relationship between Willingness to generate own electricity and the perceived benefits.

The findings of the study contradict with the findings of Hansla et al. (2008) which found the increase in consumers' willingness to accept the renewable energy to be positively associated with their perception about the benefits the renewable energy offers. The results of this study are also not consistent with the observations by Bang et al. (2000) which also concluded that there is a positive relationship between the perceived benefits and willingness.

5.3 WILLINGNESS TO GENERATE ELECTRICITY AND ENVIRONMENT CONCERN

H2o: There is negative relationship between *Willingness to generate own electricity and the environmental concern.*
H2a: There is a positive relationship between *Willingness to generate own electricity and the environmental concern.*

In this study I found that there is a relationship between electricity customers willingness to generate own electricity and their environmental concern. The more electricity customers are concerned about the environment the more they will be willing to generate their own electricity. The above finding is consistent to previous studies on the growing environmental concerns by customers globally (Canova et al. 2020).

Electricity customers are more likely to generate their own electricity using means that are not detrimental to the environmental, as they are more concerned by the continue pollution of the environment resulting from Eskom coal electricity generating.

5.4 WILLINGNESS TO GENERATE ELECTRICITY AND PERCEPTION OF SELF-EFFECTIVENESS

H3o: There is negative relationship between *Willingness to generate own electricity and the perception of Self-Effectiveness.*
H3a: There is a positive relationship between *Willingness to generate own electricity and the perception of Self-Effectiveness.*

In this study I found that there is a relationship between electricity customers willingness to generate own electricity and the perception of self-effectiveness. The more electricity customers perceive that they are capable of generating their own electricity about the more they will be willing to generate their own electricity. The above finding supports previous studies that concluded that

Customers are influenced by Perception of self-effectiveness in their decision making, which includes whether they are capable of doing something or not (Irfan et al. 2020).

This study also aligns to the study done by Ham et al. (2015) which concluded that perception of self-effectiveness was influential to the customer's energy usage intention in a positive way. Once the electricity customers perceive that they have all the necessary resources and capability to generate their own electricity, they are more likely to do so. The electricity customers are therefore expected to generate their own electricity because of their perceived self-effectiveness.

5.5 SUMMARY OF FINDINGS

The findings as summarised on table 13 below show that only two of the three hypotheses are supported. H1 was found not to be supported and insignificant, meaning there is no positive relationship between willingness to generate own electricity and perceived benefits. On the other hand, H2 was supported confirming that there is there is a positive relationship between willingness to generate own electricity and the environmental concern. Similarly, it was found that there is a positive relationship between willingness to generate own electricity and perception of Self-Effectiveness, which support H3.

Table 13: Results of Research Hypothesis

	Hypothesis	**Results**
H1	There is a positive relationship between *Willingness to generate own electricity and perceived benefits.*	Not Significant
H2	There is a positive relationship between *Willingness to generate own electricity and the environmental concern*	Supported
H3	There is a positive relationship between *Willingness to generate own electricity and perception of Self-Effectiveness*	Supported.

5.6 CONCLUSION

Chapter 5 presented and critically discussed the research findings, analysed the hypotheses and the results application, followed by relating them to previous literature.

6 CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

The chapter will discuss the recommendations and implications of the study

6.2 PRIMARY FINDINGS CONCLUSION

The findings of the study failed to prove that there is positive relationship between willingness to generate own electricity and perceived benefits. It failed to prove and confirm the one of the hypotheses that the researcher wanted to confirm prior the study. On a positive note, the other two of the three hypotheses were successfully proven. That was observed by the results showing that there is a positive relationship between willingness to generate own electricity and the environmental concern. Similarly, it was found that there is a positive relationship between willingness to generate own electricity and perception of Self-Effectiveness.

6.3 LIMITATIONS

The study was limited to mainly 3 factors that they have potential of driving households' willingness to generate their own electricity post amendment of the Electricity Regulation Act in South Africa. Given the limited time frame of the research, only 120 participants responses were used for the study. The study was mainly targeted for Gauteng electricity users.

6.4 RECOMMENDATIONS AND IMPLICATIONS OF THE STUDY

6.4.1 Future studies

The future studies can research further and confirm if they cannot come out to different conclusion as far as successfully proving that there is positive relationship between willingness to generate own electricity and perceived benefits, as this study was unable to prove. Further studies can also seek to

examine and identify if there are other drivers of households' willingness to generate their own electricity after the amendment of the Act.
Another study that can be done in future, may include investigating on the impact of generating own electricity since the amendment of Electricity Regulation Act in South Africa. The study may focus on the cost savings to the customers who will start generating their own electricity post the amendment of the Electricity Regulation Act in South Africa.

6.4.2 Practical implications

As the Electricity Regulation Act has now been amended, South African government may need to consider providing more awareness to electricity consumers in South Africa, about the benefits of generating their own electricity. That will require a shift to the previous focus where electricity customers were always been encouraged to use electricity sparingly during times when Eskom was unable to meet the electricity demand. The focus should be to encourage those who are able to generate their own electricity to do so, and that will reduce the pressure on Eskom' system caused by excessive demand. Eskom will then have enough spare capacity which will be utilized by commercial customers and in turn grow the South African economy.
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APPENDICES

APPENDIX A: CRONBACH COEFFECIENT ALPHAS

Scale: Self effectiveness

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.716	0.723	3

Item Statistics

	Mean	Std. Deviation	N
SI1	4.15	1.097	120
SI3	4.4	0.965	120
SI2	3.81	1.147	120

Item-Total Statistics

	Scale Mean if Item Deleted	Variance if Item Deleted	Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
SI1	8.21	3.007	0.628	0.465	0.505
SI3	7.96	3.519	0.594	0.44	0.568
SI2	8.55	3.527	0.408	0.169	0.789

Scale: Peceived Benefit

Reliability Statistics

Cronbach's Alpha	N of Items
0.829	5

Item Statistics

	Mean	Std. Deviation	N
PB1	4.31	0.994	120
PB2	4.42	0.913	120
PB3	4.32	0.917	120
PB4	4.28	1.055	120
PB5	4.03	1.219	120

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PB1	17.04	10.864	0.573	0.399	0.809
PB2	16.93	10.5	0.723	0.55	0.771
PB3	17.03	11.125	0.596	0.435	0.804
PB4	17.07	9.861	0.7	0.526	0.772
PB5	17.33	9.734	0.577	0.476	0.816

Scale: Willingness to Generate electricity

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.827	0.826	3

Item Statistics

	Mean	Std. Deviation	N
WPSE1	2.78	1.547	120
WSE2	2.74	1.498	120
WSE3	2.22	1.33	120

Item-Total Statistics

	Scale Mean if Item Deleted	Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
WPSE1	4.96	6.141	0.749	0.575	0.694
WSE2	4.99	6.563	0.713	0.54	0.732
WSE3	5.52	7.983	0.603	0.367	0.838

Scale: Environmental Concern

Reliability Statistics

Cronbach's	Cronbach's Alpha Based on Standardized Items	N of Items
0.9	0.899	4

Item Statistics

	Mean	Std. Deviation	N
EC1	3.93	1.106	120
EC2	4.01	1.119	120
EC3	4.05	1.144	120
EC4	4.29	1.024	120

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EC1	12.35	8.162	0.869	0.851	0.837
EC2	12.28	8.083	0.871	0.854	0.836
EC3	12.23	8.5	0.76	0.59	0.878
EC4	11.99	9.84	0.621	0.386	0.923

APPENDIX B: QUESTIONNAIRE

QUESTIONNAIRE FOR HLAMALANI CORDLEY HLUNGWANI



Thank you for agreeing to participate in the study, filing in the survey is a sign of consent. However, you are at liberty not to respond to questions you do not feel comfortable responding to.

The questionnaire may take 5-10 minutes of your time.

Perceived benefits

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
PB1	Generating my own electricity will assist the country to have less or none load shedding	1	2	3	4	5
PB2	Utilization of renewable energy reduces carbon emissions and improve energy structure	1	2	3	4	5
PB3	Generating my own electricity through renewable energy would improve public surroundings	1	2	3	4	5
PB4	Energy supply would become improved with the utilization of renewable energy	1	2	3	4	5
PB5	Employment opportunities will be increased with the installation of new renewable energy projects	1	2	3	4	5

Perception of self-effectiveness

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
PSE1	I do have the required knowledge to generate my own electricity	1	2	3	4	5
PSE2	I am well equipped to take control of the electricity that I will generate	1	2	3	4	5
PSE3	I have necessary resources required to generate my own electricity	1	2	3	4	5

Environmental concern

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
EC1	I am anxious about pollution	1	2	3	4	5
EC2	I am anxious of environmental problems	1	2	3	4	5
EC3	I am anxious of climate change	1	2	3	4	5
EC4	Utilization of alternative sources of electricity can improve the environment	1	2	3	4	5

Willingness to generate own electricity

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
WSE1	I will save on electricity costs if I generate my own electricity	1	2	3	4	5
WSE2	Generating my own electricity will enable me to have a control over my electricity capacity	1	2	3	4	5
WSE3	I will generate electricity regardless of who generates his or her own electricity within my circle	1	2	3	4	5