The significance of the small-scale renewable energy market for Eskom

By

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DECLARATION

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- I am thankful to God for the opportunities I have received in my life, one of which is the ability to continue with my studies, which is my passion. I dedicate this study to my 7-year-old daughter, Kuhle Uminathi Mpanza, for sitting right next to me throughout this journey, even when I was taking her time.
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- This, I dedicate to you all!

ABSTRACT

Eskom is a state-owned company that has supplied South Africa and the southern African region with electricity for over 100 years. It has been more than ten years since the first 'load shedding' occurred in 2008, which intensified between 2019 and 2020. Eskom has been providing electricity at all costs, despite challenges due to commissioning delays and underperformance of new-build generators. These challenges have led to chronic failures of aging generation equipment in the last two years, causing lower-than-optimal economic growth in the country. The Energy Availability Factor, which provides a monthly percentage of available megawatts (MW) from the total fleet, has fallen in the last three years. These challenges form the basis that necessitate a study such as the current investigation, which focuses on alternative measures that Eskom can implement to meet the electricity demand for the country, other than depending on coal-fired generation plants, to increase the capacity of electricity delivered, to improve the availability of installed capacity, and to maintain and increase the customer base. This qualitative study was conducted to examine the significance of the small-scale renewable energy market for Eskom, which can provide alternative electricity sources for customers and improve the organisation's financial state. Purposive sampling was used to select the 20 participants included in the study, and semi-structured interviews were conducted via MS Teams. The participants comprised Eskom Distribution managerial employees who form part of a small-scale renewable energy project for Eskom. Thematic analysis was used to analyse the data collected during the interviews. From the findings, it emerged that participants viewed Eskom's participation in the small-scale renewable energy market as critical to the country in many ways, in terms of retaining and gaining customers, benefiting stakeholders such as customers, developers, financial institutions, and educational institutions, and ultimately ensuring long-term energy security for the country. The recommendations emanating from the study are that Eskom needs to: 1) ensure that there are plans for distribution network expansion and improvement to accommodate renewable energy sources; 2) reconsider connection costs for renewable energy plants to be more affordable for the customers; 3) ensure that product marketing is intense to attract more customers; and 4) facilitate workforce training for proper execution of work related to the renewable energy market.

Keywords: Customer, Eskom Distribution, small-scale renewable energy,

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

BESS	-	Battery Energy Storage Systems
CCA	-	Community Choice Aggregation
CNCs	-	Customer Network Centres
CoC	-	Certificate of Compliance
DEE	-	Department of Electricity and Energy
DG	-	Distributed Generation
DMPR	-	Department of Mineral and Petroleum Resources
DMRE	-	Department of Mineral Resources and Energy
DSM	-	Demand Side Management
ECSA	-	Engineering Council of South Africa
EGI SEA	-	Electricity Grid Infrastructure Strategic Environmental Assessment
EGI	-	Electricity Grid Infrastructure
EOC	-	Electricity Outage Cost
ERA	-	Electricity Regulation Act
FS	-	Free State
GHG	-	greenhouse gases
IoE	-	Internet of Energy
IPP	-	Independent Power Producers
IRP	-	Integrated Resource Plan
JET	-	Just Energy Transition
KZN	-	KwaZulu-Natal
MEC	-	Minerals-Energy Complex
MLP	-	Multi-Level Perspective on sustainability transition
MVA	-	Megavolt Ampere
MW	-	Megawatts
NERSA	-	National Energy Regulator of South Africa
PPAs	-	Power Purchase Agreements
PV	-	Photovoltaic
RE4IP	-	Renewable Energy Independent Power Producers Procurement Program
REFIT	-	Renewable Energy Feed-In Tariff
REIPPs	-	Renewable Energy Independent Power Producers
SALGA	-	South African Local Government Association
SDGs	-	Sustainable Development Goals

SSEGs	-	Small-Scale Embedded Generators
VPP	-	Virtual Power Plants

CHAPTER 1: INTRODUCTION TO THE STUDY

1.1 Introduction

Eskom is a state-owned company that has been supplying South Africa and the southern African region with electricity for over one hundred years. The generation fleet operates more than 47,000 megawatts (MW) of nominal capacity as of March 2022 from 27 power stations (Eskom, 2023a; Pram, Kambule & Adepoju, 2022). For more than ten years, since the first load shedding in 2008, which intensified between 2019 and 2020 with about 1.3TWh of load shed, Eskom has been providing electricity under challenging conditions due to commissioning delays and underperformance of new-build generators (Eskom Performance Commentary, 2024; Wright & Calitz, 2020). This has led to aging generation equipment and chronic failures between 2021 and 2022 that caused economic meltdown in the country (Bowman, 2020; Pram et al., 2022). The Energy Availability Factor, which provides a percentage of available MW from the total fleet monthly, fell from 65% to 53% between 2020 and 2023 (Business Live, 2023).

Broadening the understanding of and available literature related to these challenges requires a study such as the current research, which focuses on alternative measures to be implemented by Eskom that would allow the state-owned company to meet the demand needed for the country, other than depending on coal-fired generation plants. This would allow for increased capacity of electricity delivered, increased availability of installed capacity, and would enable Eskom to maintain and increase the customer base. This research thus examines the significance of the small-scale renewable energy market for Eskom, which can provide alternative electricity sources for customers and improve the organisation's financial sustainability through the implementation of small-scale renewable energy generation. This chapter provides the background of the study and discusses the rationale, limitations, and motivation for this research. The focus of the research, problem statement, objectives, research questions, and methodology that were followed in the study are also outlined in the chapter.

1.2 Background of the study

As the world progressed towards greater technological advancement during the Third Industrial Revolution in the late twentieth century, electricity became the core of economic growth around the world. The technologies that were developed to improve ease of access to the electricity grid became an important part of the modern economy, which includes households, industries, and other marketplaces (Kenny et al., 2015). In the history of electricity generation in South Africa, the Eskom Generation Division has been solely responsible for the generation of electricity. It was evident in 2003 that the country would soon

experience a power shortage, and three power stations, namely Grootvlei, Camden, and Komati, were returned to service, but shortly afterwards, the demand rose from 31928 MW to 34195 MW in 2004 (Eskom, 2024). When load shedding was introduced in late 2007 and continued to be a new norm, Eskom's Generation Division embarked on long-term solutions to minimise and ultimately eliminate load shedding to keep the power system stable. Load shedding is a result of fossil fuel-based power unit failures that cause the power system to fail in meeting South Africa's power demand, as well as neighbouring countries supplied from the Eskom grid. Between 2008 and 2019, load shedding occurred during 33 months of this period and cost the South African economy about R35 billion (Walsh, Theron, Seedat & Reeders, 2021). The year 2015 had the highest number of load shedding events, with 84 days, while there was no load shedding in 2016 and 2017 (Mediahack, 2020).

The impact of load shedding on the economy of South Africa in 2008 saw a drop in economic growth from 5.4% at the end of 2007 to 1.57% at the beginning of the year 2008 (Inglesi & Pouris, 2010). Three new generation fleets, Ingula pump storage, Kusile, and Medupi power stations were built from 2005, and the last of four units adding 800 MW at Kusile was commissioned at the end of 2021 to increase capacity and pump storage (Eskom, 2021). The total new fleet added 9600 MW to the existing generation base load, where each (Medupi and Kusile) produces 4800 MW, and Ingula added 1332 MW using a hydro pump storage facility (Gregory, 2020). The challenges with Eskom's generation fleet emanate from the fact that there had been no new infrastructure added to the system since the 1980s, and the majority had reached the end of their life, while poor maintenance over the years contributed immensely to poor plant performance (De Vos, 2019). The uniqueness of electricity is that it cannot be stored like other types of energy, such as chemical and gravitational (hydroelectric) energy, which can be stored in batteries and dams, respectively. This makes it difficult to save electricity for future use, as it must be available when needed, while other energy sources are available as part of storage systems to support the base electricity, but cannot be used as the main source due to capacity limitations (Kenny et al., 2015).

Considering the lengthy time it took to complete or partially complete the three new electricity generation fleets mentioned above that use fossil energy, it is evident that the country cannot wait for solutions from the current form of electricity generation. Other sources, like renewable energy, which are already available in the market, must be acquired by Eskom's Transmission and Distribution Divisions, while the long-term solutions are being established by the Generation Division. It is for this reason that this research into the significance of the small-scale renewable energy market for Eskom is necessary to establish the benefits it may offer to Eskom and its customers.

1.3 Motivation of the study

According to the Department of Mineral Resources and Energy (DMRE, 2024a), now strategically separated as the Department of Electricity and Energy (DEE) and the Department of Mineral and Petroleum Resources (DMPR), in 2017, Eskom purchased 6422 MW of electricity, and 3162 MW was connected to the Eskom grid from Renewable Energy Independent Power Producers (REIPPs). By 2030, the small-scale embedded generators (SSEGs) for home use will produce about 4000 MW, which is between 1600 @ 2.4 kW/customer and 3300 @ 1.2 kW/customer for residential customers (Independent Power Producers, 2020). This presents the possibility of Eskom Distribution customers being lost to alternative electricity supplies, reducing demand from Eskom, and ultimately putting Eskom out of business. Considering that over 7 million Eskom customers are connected to the Eskom Distribution electricity network (Eskom, 2024), this serves as motivation for the Eskom Distribution Division to outline the significance of the small-scale renewable energy market for the entity to be able to attract more shareholders and sponsors by participating in carbon reduction initiatives, providing uninterrupted, cleaner and affordable electricity (African Energy, 2021; Kekana, 2020) and finding ways to retain and increase the customer base. This research aims to provide an understanding and insight into these alternative energy generation sources and how these can be harnessed to secure Eskom's business interests from the perspective of Eskom management.

1.4 Focus of the study

This research focuses on the significance of the small-scale renewable energy market for Eskom. This is a qualitative research study that aims to identify the importance of Eskom's participation in the small-scale renewable energy market, to identify the benefits of the small-scale renewable energy market, and to determine the possible challenges of participating in the small-scale renewable energy market for Eskom Distribution.

1.5 Problem statement

Eskom has relied on supplying electricity mainly through coal-fired generators (with a capacity ranging between 39800 and 44013 MW) and a small portion from nuclear (1934 MW), gas (2591.3 MW), wind (3400 MW), and hydro and pumped storage (3300 MW), which are usually used as backup or during peak loads (Clark & McGregor, 2024; Eskom, 2023a). South Africa is one of the 18 countries in Sub-Saharan Africa that uses renewable electricity, which is primarily produced by some Independent Power Producers (IPPs), with limited access from other renewable energy producers due to limitations in the electricity structure of the country (Mhlanga, 2020). The coal-fired generators have degraded due to the lack of proper maintenance, delayed commissioning, and the underperformance of the new fleet has

weakened the system (Wright & Calitz, 2020). Eskom's reliance on coal-fired electricity generation delays the process of adding renewable energy sources to the electricity grid to reduce carbon emissions. The slow pace of electricity structure improvement and expansion delays opportunities for other electricity generators to participate in the electricity market, which would minimise or eliminate electricity constraints by producing electricity from other sources of energy. Eskom saw declining sales in 2022 compared to 2008 (BusinessTech, 2023). According to the DMRE (2021a), about 71,073 GWh of energy was generated by IPPs in 2021. Eskom, therefore, needs to find means of keeping and increasing its customer base by providing alternative electricity supply to its customers, and defining the significance of Eskom's participation in the small-scale renewable energy market.

1.5.1 Research aim and objectives

The study aimed to examine the significance of the small-scale renewable energy market for Eskom Distribution. The following objectives assisted in achieving this aim:

- To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution.
- To identify the benefits of the small-scale renewable energy market for Eskom Distribution.
- To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution.

1.5.2 Research questions

The following research questions were formulated to obtain answers in response to the objectives of this study:

- What is the importance of participating in the small-scale renewable energy market for Eskom Distribution?
- What are the benefits of the small-scale renewable energy market for Eskom Distribution?
- What are the challenges of participating in the small-scale renewable energy market for Eskom Distribution?

1.6 Scope of the study

The scope of this research is to define the opportunities that Eskom distribution has in the small-scale renewable energy market. This includes indicating how Eskom Distribution will benefit from participating in this market. The research also sought to identify possible challenges that can surface and hinder the success of Eskom Distribution in participating in the small-scale renewable energy market.

1.7 Research rationale and methodology

According to the University of Melbourne (2025), the rationale in a study is when there is a requirement to provide a reason or justification for a choice or action made over other available options or concepts. In research, the rationale is an assortment of statements of significance and purpose, and it addresses an identified gap or need (University of Melbourne, 2025). The rationale of this study is based on the fact that three departments are directly participating in the small-scale renewable energy project for Eskom Distribution, and the issues pertinent to these departments and their operations require investigation through research. These departments are Asset Creation, which deals with electrical engineering new builds and expansions, Customer Services, which manages customer care and billing, and Maintenance and Operations, which deals with electrical engineering asset maintenance and operations throughout their life cycle. Small-scale renewable energy technology is relatively new in Eskom Distribution, and it is mostly managers, professionals, and advisors who participate in the testing and decision-making processes for small-scale renewable energy technologies and customer services or offerings in Eskom Distribution.

This research sought to understand the views and opinions of the participants regarding Eskom's small-scale renewable energy project; thus, a qualitative research approach and design were used for this study. According to Creswell and Creswell (2018), qualitative research investigates attitudes and behaviour and comes with complete variables. The qualitative research approach was critical for the implementation of this research to generate opportunities to determine complexity and include a range of perspectives (Ramanadhan, Revette, Lee & Aveling, 2021). Basti and Madadizadeh (2021) stated that it is time-consuming and almost impossible for a researcher to study an entire population; therefore, it is best to follow an efficient sampling method. Owusu Sarfo, Debrah, Gbordzoe and Obeng (2022) indicated that a sample is a portion that represents a large population, and sampling is the process of acquiring this portion from a population. A purposive sampling technique was used to select a sample of 20 management employees (a selection of 10 in each of the 2 provinces) from Asset Creation, Maintenance and Operations, and Customer Services departments in the Free State (FS) and KwaZulu-Natal (KZN) provinces. Participants were emailed invitations to participate in the study. Semi-structured interviews were conducted via Teams with 20 managers from the Eskom Distribution Central East Cluster to obtain their in-depth views and opinions, which form the basis of the qualitative research findings generated in this study. Data collected from the interviews was analysed using thematic analysis to determine the common points of interest that emerged in the interviews (Creswell & Creswell, 2018).

Other Eskom Divisions (Generation and Transmission) were excluded from the interviews. External stakeholders were also excluded from the interviews. The managers from Eskom Distribution, Central East

Cluster, which is a merger of FS and KZN Provinces that participate in the small-scale renewable energy project, are the only participants who were included in the interviews.

1.8 Chapter organisation

Chapter 1: Introduction

This chapter includes the background, motivation, and focus of the study, and outlines the problem statement, research objectives, and research questions guiding the study. It also briefly states the methodology that was applied for the study and the layout of the chapters included in the write-up of the research to follow.

Chapter 2: Literature Review

This chapter focuses on a comprehensive review of the literature relevant to the study. The chapter briefly presents the theoretical framework underpinning the study before moving on to a discussion of the emergence of renewable energy and Eskom's adoption of renewable forms of energy, in terms of the significance of the benefits to the state-owned company in meeting the electricity demands of the country. The challenges presented in Eskom's participation in the small-scale renewable energy sector are also considered. The last part of the chapter examines the policies relevant in terms of guiding the country's shift to renewable energy.

Chapter 3: Research Methodology

This chapter outlines the interpretivist qualitative research design that was adopted in conducting the research and elaborates on the sampling, data collection, and analysis methods that were used in obtaining relevant data to address the objectives of the study. The ethical considerations borne in mind by the researcher and the techniques used to ensure the trustworthiness of the findings are also outlined.

Chapter 4: Findings

This chapter presents the findings that were generated from the data collected during the interview with participants and provides a brief interpretation of the findings. Excerpts from the interviews will be presented according to the themes that were derived from the analysis of the interview transcripts, which address the three research objectives.

Chapter 5: Discussion

This chapter discusses the findings of the study by drawing on previous research to contextualise the findings in terms of the similarities and points of contrast that can be drawn, and application to the specific context of the shift to renewable energy in South Africa. The discussion of the findings is organised

according to the three objectives guiding the study and the themes that emerged from the interviews that speak to each of the objectives.

Chapter 6: Conclusion and Recommendations

This final chapter presents the overall conclusions that can be drawn from the research through a summary of significant findings. The chapter also presents the recommendations for Eskom Distribution as it proceeds to broaden its venture into the renewable energy sector, and also suggests possibilities for future research that can be undertaken to widen the existing body of literature addressing this topic of interest. Lastly, the limitations of the study will be stated.

1.9 Chapter summary

This chapter has established the basis of this research. It indicated the position of Eskom in terms of its mandate to increase the production of electricity by tapping into renewable energy generation, with a focus on the small-scale renewable energy market. The background of Eskom and the challenges that make this study an option for recommending available solutions to improve the state of electricity in South Africa are provided in this chapter. The research objectives, research questions, and motivation and rationale for the study assist in guiding the analysis of the findings derived from the study, which will benefit Eskom Distribution in the future. The following chapter presents the literature review on the significance of the small-scale renewable energy market for Eskom.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In the previous chapter, the background of the research was explained, as well as the objectives and methods employed to achieve these objectives. In this chapter, the literature related to the renewable energy market, particularly small-scale energy generation, will be reviewed. This study of the significance of the small-scale renewable energy market in Eskom Distribution will establish the possibilities that lie ahead as Eskom transforms into becoming compliant with reducing carbon emissions and becoming profitable again by venturing into the renewable energy market. This chapter will review literature related to the benefits of small-scale renewable energy generation, as well as the opportunities and challenges presented in this market. Similar studies that have been conducted previously will be reviewed to determine what benefits, possible opportunities, and challenges exist. Renewable energy is the future of electricity generation instead of fossil fuels, which are currently used to generate electricity. Strantzali, Aravossis and Livanos (2017) stated that sustainable electricity development is part of an energy plan that consists of policies for the future of a country that considers a variety of aspects of energy of the country under study, such as environmental, political, and social state. Planning outlines the transformation process and seeks to find what fits the government and the organisation (Strantzali et al., 2017). This aligns with the current study, which aims to determine the significance of small-scale energy generation for Eskom.

2.2 Theoretical framework of the study

A theoretical framework is an introductory review of existing theories applied as a roadmap for creating the arguments that will be used to explain the theories that support the research, confirming that the chosen topic is grounded in established ideas (Vinz & George, 2022). According to Vinz and George (2023), the theoretical framework defines the key concepts in research. It recommends relationships between them, and relevant theories are discussed based on the review of literature undertaken in a study.

It is said that Eskom has relied on coal-fired electricity generation, and that has caused delays in the infrastructure improvement and expansion to accommodate alternative sources of supply like renewable energy (Clark & McGregor, 2024; Mhlanga, 2020). According to Clark and McGregor (2024), Eskom supplies the majority of South Africa's electricity. Ting and Byrne (2020) suggest a theoretical approach to understanding the challenges in energy supply in South Africa in terms of a multi-level perspective (MLP) on sustainability transition to renewable energy sources of electricity supply. According to Hlebela (2021) and Ting and Byrne (2020), the MLP include the current sociotechnological regime (the locus of established practices and associated rules that stabilise existing systems which is the fossil fuel generated electricity from Eskom), the landscape surrounding the regime – in this case the electricity grid that is not

accommodative of renewable energy sources, and the niche space in which innovation is conceived, developed, and finally develops to change or replace the regime that can be provided by implementation of renewable energy sources. According to Cambridge English Dictionary (2025) and Mirriam-Webster Dictionary (2025), regime refers to mode of rule or management, or a government in power. Ting and Byrne (2020) view Eskom as the dominant central actor in the Minerals-Energy Complex (MEC) in South Africa and a significant force in the country's economy, which gives it the power to influence and shape the outcome of the implementation of renewable energy sources in the country. This perspective will be discussed in this research to determine the significance of Eskom in participating in the small-scale renewable energy market.

Rambe and Modise (2016) discuss the theoretical construct of self-leadership, where individual employees were motivated to lead themselves, but later identified missing leadership traits such as flexibility, stability, and sensitivity to others. They stated that the lack of flexibility from Eskom's senior management is evident in their resistance to creating competition through introducing Independent Power Producers (IPPs) to break the monopoly enjoyed by Eskom in the electricity generation and distribution industry. It is only recently that Eskom has made it excessively difficult and unprofitable for private generators to sell electricity to its grid. The South African energy policy, the renewable energy policy, and other related policies and regulations provide guidance and support on the implementation of renewable energy in South Africa, particularly the role expectation from Eskom, and will be discussed in this study.

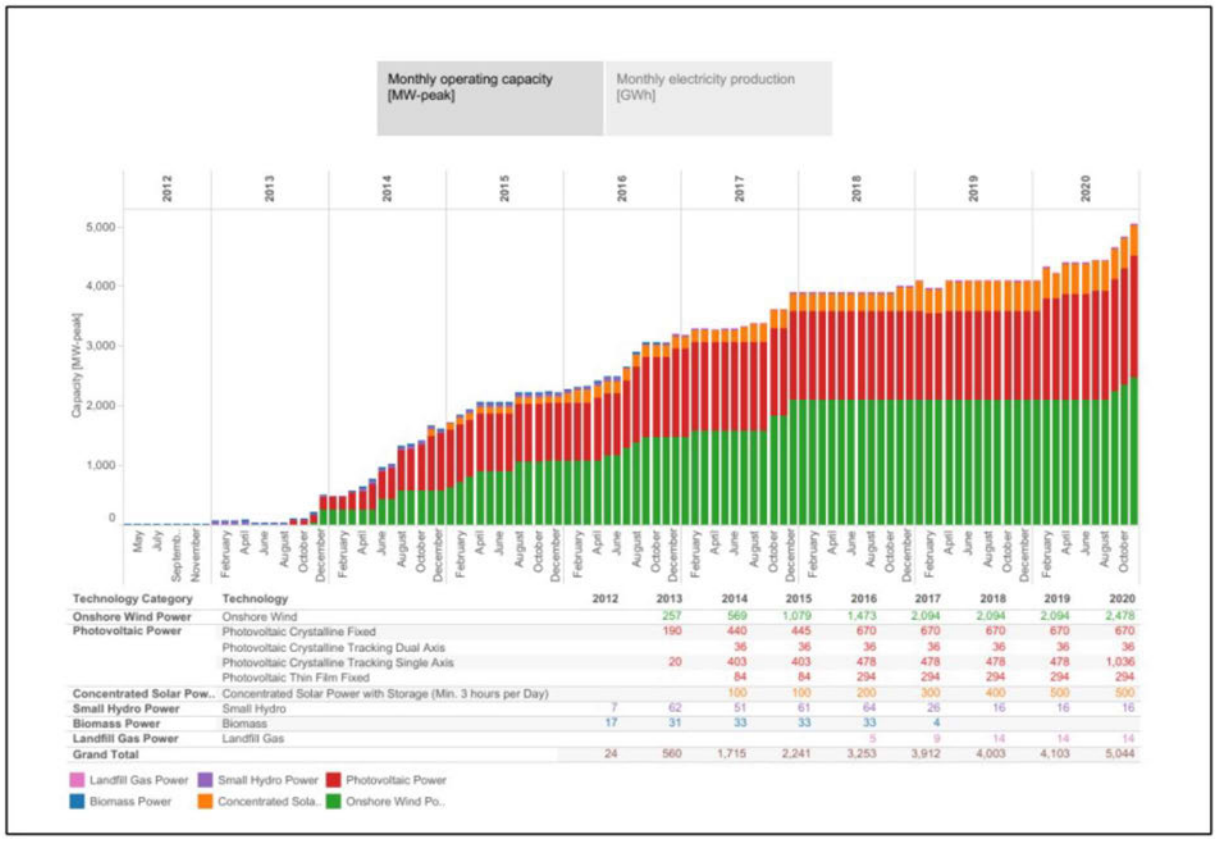
2.3 The emergence of the renewable energy market

Renewable energy is the repurposing of sources of energy that have been used since ancient times in Rome, Greece, China, and Iran for household and manufacturing needs, for instance, to grind grain and irrigate crops (DGB Group, 2023). The rise in environmental requirements to reduce the impact on the ozone layer and the scarcity of oil needed to power fossil fuel-based sources of electricity saw the rise of using renewable sources of energy from the 1970s (DGB Group, 2023). Literature indicates that electricity generation using renewable energies first began in the 18th century, and the first commercial solar plant used for water and lights was introduced in 1800 (Gomstyn, 2024). Pablo-Romero, Sánchez-Braza, and Galyan (2021) stated that renewable energy use dropped from 1995 to 2016, but then picked up momentum in 2016 when the world was experiencing a rise in climate change, which required a reduction in the emission of greenhouse gases (GHGs). They further stated that policies and agreements to enforce compliance were established around 2015 or earlier in various countries. Although Eskom is committed to implementing renewable energy sources for electricity supply in South Africa, the country is not yet ready for renewable sources to be the primary source of energy. This is because there are many constraints, such as slow advancement in technology and the need to improve optimal design of renewable power system

components that are bi-directional in the flow of electricity, which the Eskom grid is not yet fully capable of handling (Thopil, Bansal, Zhang & Sharma, 2018). Thopil et al. (2018) stated that the country does, however, need to gradually change from the intensive use of coal to meet the targets set for renewable energy as introduced in the REIPPP initiative. This is the niche space of the MLP framework in which innovative ideas are consolidated, developed, and finally applied to change the Eskom power system to accommodate renewable energy sources.

2.3.1 Transition from fossil to renewable energy

Vidal-Amaro (2015) stated that it is critical to establish a gradual plan to transition from fossil fuel to renewable energy sources over a defined period, which must be monitored closely as the process unfolds. Positive economic growth is forecast for Africa between 2030 and 2050, though the biggest economies in Africa, of which South Africa's GDP was ranked number one in 2023, still primarily use fossil fuel to generate electricity. The countries are capable of transitioning to renewable energy sources to address the economic forecast, especially since the African Development Bank will not be financing any new projects related to fossil fuels such as coal (Lu, 2024; Mutezo & Mulopo, 2021).



Technology Category	Technology	2012	2013	2014	2015	2016	2017	2018	2019	2020
Onshore Wind Power	Onshore Wind		257	569	1,079	1,473	2,094	2,094	2,094	2,478
Photovoltaic Power	Photovoltaic Crystalline Fixed		190	440	445	670	670	670	670	670
	Photovoltaic Crystalline Tracking Dual Axis			36	36	36	36	36	36	36
	Photovoltaic Crystalline Tracking Single Axis		20	403	403	478	478	478	478	1,036
	Photovoltaic Thin Film Fixed			84	84	294	294	294	294	294
Concentrated Solar Pow..	Concentrated Solar Power with Storage (Min. 3 hours per Day)			100	100	200	300	400	500	500
Small Hydro Power	Small Hydro	7	62	51	61	64	26	16	16	16
Biomass Power	Biomass	17	31	33	33	33	4			
Landfill Gas Power	Landfill Gas					5	9	14	14	14
Grand Total		24	560	1,715	2,241	3,253	3,912	4,003	4,103	5,044

Figure 2. 1: Monthly peak operating megawatt (MW) for each renewable technology from 2012 to 2020 *(Source: Gongxeka, 2023: 2)*

Figure 2.1 above shows the monthly peak operating megawatts (MW) for each renewable technology from 2012 to 2020 in South Africa. The graph shows that the total capacity increased from 24 MW to 5020 MW in 2012 and to 5044 MW in 2020. Govender and Dempster (2019) stated that this value will exceed 20,000 MW by 2030, and renewable energy will gradually replace Eskom's coal fleet.

Ting and Byrne (2020) discussed the sustainability transition literature and stated that management administrations are sources of stagnation, in which it may be difficult to achieve change due to resistance and organisational culture lock-in. Eskom, in this case, is seen to be the regime that has resisted adding renewable energy sources to its electricity generation fleet. Eskom accesses renewable energy sources through IPPs and owns some small renewable energy plants like the Sere Wind Farm in the Western Cape with a capacity of 105.8 MW (Eskom Fact Sheet, 2021). According to Mohlakoana, Wolpe, and David (2023), Eskom has no plans to construct new coal-fired power stations; instead, the project to repurpose land for renewable energy or to lease land to IPPs is underway. On the electricity distribution side of Eskom, Mohlakoana et al. (2023) stated that renewable energy comes from small-scale embedded generation (SSEG), which is used by small businesses and customers that are on a medium to high Living Standard Measure that can afford it. They further stated that Eskom Distribution's participation in this market is through tariff establishment and cost recoveries for electricity generation to the network grid from the SSEG. This poses an opportunity for Eskom Distribution to partner with the business communities and high Living Standard Measure communities to forecast the infrastructure growth requirement to prepare for more energy generators to participate in the small-scale renewable energy market. It is due to improvement opportunities such as these that there is a need for research such as the current study to be conducted to identify the significance of Eskom Distribution's participation in the small-scale renewable energy market.

2.3.2 Renewable energy as an alternative means of electricity supply

According to Kumar (2020), contemporary energy sources such as coal and gas are ideal for the economic growth of a country; however, they result in negative environmental impacts. It is due to these undesirable impacts that renewable energy sources are gradually being introduced into the energy system to reduce the negative effects of fossil fuels on the environment. Renewable energy contributes to the reduction of carbon emissions from conventional energy sources, and its impact on the world economy has been the centre of recent discussions in all related market circles (Kumar, 2020; Saidi & Omri, 2020). Most of the studies on the contribution of renewable energy to the economies of countries focus on the reduction of carbon emissions (Aydoğan & Vardar, 2020; Saidi & Omri, 2020; Zafar, Shahbaz, Sinha, Sengupta & Qin, 2020).

According to Mutezo and Mulopo (2021), Africa's economic growth and energy demand are forecasted to be on the rise between 2030 and 2050. They further indicated that Africa can accelerate the transition to

renewable energy to meet the forecasted future as there will no longer be financial support for fossil fuels. According to Ayamolowo, Manditereza and Kusakana (2022), South Africa is one of the most developed African countries where communities require uninterrupted clean electricity supply to support their livelihood. This confirms that the reason for the increasing energy demand is to further support the economic growth of the country. Ayamolowo et al. (2022) stated that there are renewable energy development plans in South Africa to reduce the carbon emission levels, produce cleaner energy, and provide alternative sources of supply without disruptions to the growing economy.

The South African Renewable Energy Independent Power Producer Procurement Programme is mandated by DMRE to install 17.8 GW of renewable energies from all types of sources by 2030, with a gradual increase of 11 to 18 jobs per MW, which is equal to 320 400 jobs in total for 17.8 GW (Walwyn & Brent, 2015). By the end of December 2023, the IPP Programme reported 9,048 GW of available electricity capacity produced by 111 IPPs, closing the year with 81,043 job opportunities during construction and maintenance (DMRE, 2023). This further confirms the need to identify the significance of Eskom's participation in the small-scale renewable energy market to not only increase and keep its customers, but also to support the economic growth of the country.

2.4 Small-scale renewable energy market global review

Terrapon-Pfaff, Dienst, König, and Ortiz (2014) stated that the size of small-scale renewable energy is ≤ 100 kW (or 1 MVA). They stated that renewable energy technologies are considered as predominantly suitable as they provide small-scale energy resolutions and decentralised energy supply required by the people mostly affected by energy poverty, who still depend on old-fashioned energy sources or expensive fossil fuels. They further indicated that these are people living in rural areas in developing countries or belonging to the urban poor communities, who require clean electricity, cooking, heating, and lighting solutions. Kekana (2020) stated that off-grid renewable energy in Sub-Saharan Africa drives the socio-economic outlook in rural and remote areas and therefore initiates small-to-medium economic centres, where villagers can buy and sell electricity amongst each other. Manana (2023) indicated that small-scale renewable energy is also aimed at resolving power challenges for other stakeholders, such as farmers, commercial industrial customers, including communities that are far from the grid.

The renewable energy generation and distribution are segmented into utility-scale and distributed systems (Hyder, 2024). Marsh (2021) indicated that the utility-scale renewable energy system is referred to as large-scale as it is connected and feeds directly to the utility electricity grid. It generates power at a capacity of 1 MW and above. Hyder (2024) explained that distributed renewable energy is small-scale renewable energy, less than 1MW of capacity, and is connected beyond the meter at the customer's premises for their

private use. He further stated that only excess (banked) energy is fed to the electricity grid, which is measured by the customer's meter to bill the utility. Asghar et al. (2023) stated that distributed generation (DG) and battery energy storage systems (BESS) are the essential energy sources in a modern house or infrastructure. This phenomenon of distributed small-scale renewable energy (embedded generation) transforms passive consumers of electricity into producers, who are subsequently defined as prosumers (Kotilainen, 2019; Mahmud, Khan, Ravishankar, Ahmadi & Siano, 2020).

A smart grid is an intelligent power network that integrates control and information infrastructures at an affordable cost to permit more efficient and reliable power systems operations (Hua et al., 2022), while Internet of Energy (IoE) is the upgrade and automation of electricity infrastructures for manufacturers, energy producers, and distribution utilities such as Eskom (Just Energy, 2025). According to Mahmud et al. (2020), the future smart grid or the IoE will enable all prosumers to coordinate with each other and form Virtual Power Plants (VPPs). They indicated that this can be achieved by integrating the distributed prosumers and small-scale VPPs into the IoE. Eskom supports this idea through its implementation of microgrid-based rural electrification programmes, which are the VPPs provided to customers who are located far from the network grid (Motjoadi, Bokoro & Onibonoje, 2020).

Gautier, Jacqminn and Poudou (2018) explained that there should be incentive schemes that would encourage the prosumers to compose local production and consumption supported by the local power utility, which is Eskom. This would show Eskom Distribution's interest in driving the incentive schemes to encourage prosumers to produce more electricity and inject it into the utility grid. Eskom supports this technology as it proposed the BESS project as a cost-effective alternative to the Concentrated Solar Panel project that was cancelled (Gongxeka, 2023). The BESS project was completed in various provinces such as the Western Cape and KwaZulu-Natal (Gongxeka, 2023). This confirms Eskom's position in ensuring continuous electricity to its customers.

The next sections will discuss the significance of Eskom's participation in the small-scale renewable energy market, in line with the objectives set out in this research.

2.5 Eskom's participation in the renewable energy market

Baker (2017a) stated that the Eskom grid is unable to integrate renewable energy technologies to generate electricity, as renewable energy technologies require a bi-directional supply. This is the reason for Eskom Distribution to venture into small-scale renewable energy to find means to upgrade the network such that it accommodates other sources of energy. Eskom has an opportunity to install solar photovoltaic (PV) microgrids in the rural areas where it is difficult and expensive to expand the existing infrastructure to far-reached areas (Motjoadi et al., 2020).

The environmental impact assessment for fossil fuel-based electricity generation in South Africa has driven the efforts to diversify the country's energy sources (Akinbami, Oke & Bodunrin, 2021). South Africa's DMRE releases the data for the state of renewable energy in the country quarterly. Figure 2.2 on the next page is taken from a 2024 quarter one report for the energy mix present in South Africa, and Figure 2.3 below that is the total nominal capacity required to service South Africa's electricity demand for the same period, as sourced from the same Eskom 2024 energy report (Centre for Renewable & Sustainable Energy Studies, 2024).

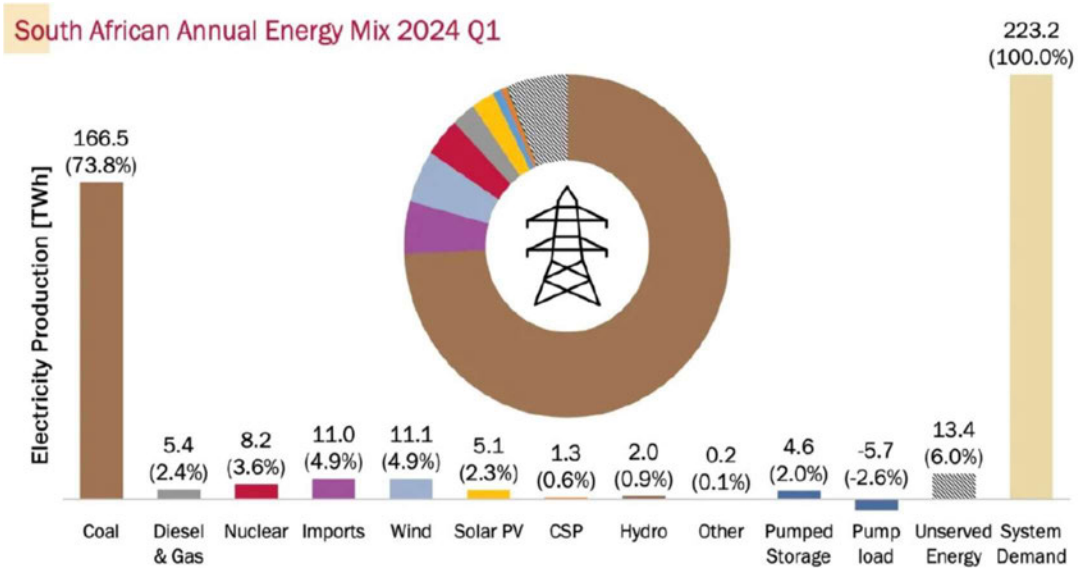


Figure 2. 2: South African energy mix as at quarter 1 of 2024 *(Source: Centre for Renewable & Sustainable Energy Studies 2024: 1)*

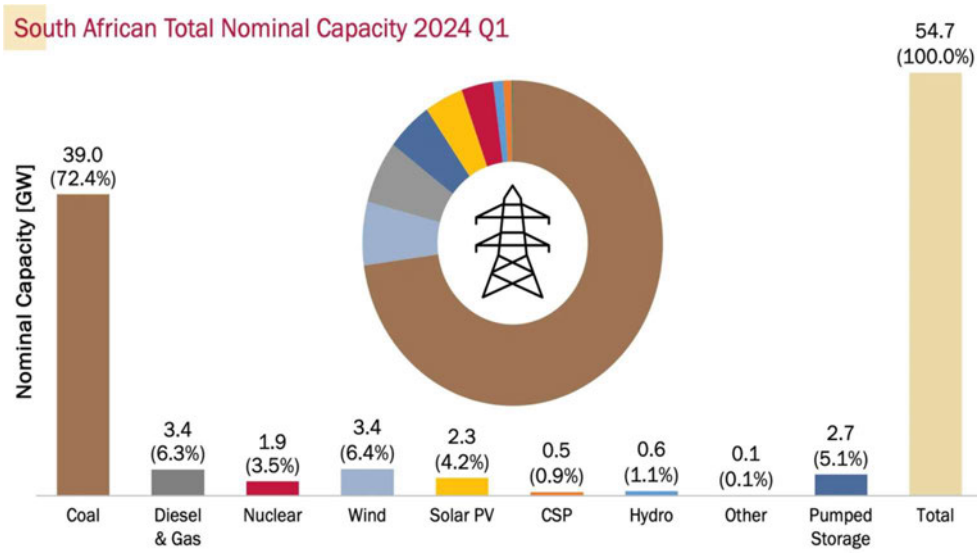


Figure 2. 3: South African total nominal capacity as at quarter one of 2024 *(Source: Centre for Renewable & Sustainable Energy Studies 2024: 2)*

Akinbami et al. (2021) stated that in further implementing various sources of renewable energy in South Africa, power purchase agreements (PPAs) were supposed to support the energy generator process for customers to connect to the grid, but these were not agreed upon. Eskom further seeks other avenues to influence green energy and pass the benefits to customers through a renewable energy tariff (Eskom, 2024b). This means that customers will experience cheaper electricity due to lower tariff charges if Eskom participates in the small-scale renewable energy market. Oliver (2021) indicated that the National Energy Regulator of South Africa (NERSA) prescribed that utilities and distributors must register their small-scale energy generators of less than or equal to 100 kW, which was passed in 2017, but that there has been a great deal of noncompliance and illegal connections by users. The City of Cape Town pronounced a deadline in 2019 that all small-scale renewable energy must be registered or customers would face a fine and disconnection if they were not compliant (Oliver, 2021).

Bhattacharyya and Palit (2021) stated that in a largely deregulated environment such as the off-grid installations, many developing countries like South Africa, Nigeria and Sierra Leone have developed policies that exempt these installations from the licensing process of small-scale renewable energy and allow the generators to follow a simplified registration process with utilities such as Eskom. The registration process has standard forms, templates, and permits to support the registration process in these countries (Bhattacharyya & Palit, 2021).

Van Schalkwyk and Scholtz (2024) stated that the registration process is widely managed by Eskom and involves converting to a time-of-use tariff, conducting studies to confirm capacity, paying initial fees to

Eskom, such as quotation fees, and proof of registration from NERSA to Eskom. They further stated that once the grid application is concluded, a test report for the Embedded Generation Installation Compliance is submitted together with an installation wiring certificate of compliance (CoC), an inverter certificate, and the registration certificate from NERSA. This is meant to legalise and ensure that the installation is safe for customers and Eskom employees when they operate the network (Van Schalkwyk & Scholtz, 2024).

Eskom's involvement in renewable energy is by establishing renewable energy utility process solutions that will support the delivery of customers' renewable energy commitments without customers procuring renewable energy through PPAs or by installing their high-cost renewable plant (DLA Piper Intelligence, 2020). Eskom launched a two-year pilot for Renewable Energy Tariff in September 2021, which is in addition to the conventional tariff, where the price reduces as the customer buys more renewable energy from Eskom (African Energy, 2021). This assists customers in reducing their electricity bills and encourages more customers to use green energy. Table 2.1 on the following page illustrates the green tariff structure for Eskom renewable energy.

Table 2. 1: Eskom's green tariff structure *(Source: Eskom, 2024b: 1)*

Energy blocks x = % of total energy that is green	Green tariff c/kWh on top of the standard tariff
1% ≤ x ≤ 10%	25
10% ≤ x ≤ 20%	22
20% ≤ x ≤ 30%	20
30% ≤ x ≤ 40%	18
40% ≤ x ≤ 50%	17
50% ≤ x ≤ 60%	14
60% ≤ x ≤ 70%	12
70% ≤ x ≤ 80%	10
80% ≤ x ≤ 90%	8
90% ≤ x ≤ 100%	5

According to Moyo (2021), the renewable energy tariff is offered to corporate customers with clean energy commitments that amount to a fine of R134 per tCO_2e, as in 2021, including tax-free allowances in the range of 75% to 95% (International Monetary Fund (IMF), 2023) of carbon emissions. The tariff is given to customers who use Eskom's renewable energy sources, for example, the Sere Wind farm (Moyo, 2021).

There is a greater benefit for companies that reduce their carbon emission and further benefit from the emission tax-free allowance. This is one of the reasons for Eskom to venture into the small-scale renewable energy market, so that it can assist the customers who have these commitments to ensure that their source of supply is from renewable energy, by using renewable energy attributes to meet their commitments.

2.6 Eskom Distribution opportunities and benefits in participating in the small-scale renewable energy market

The Duke Entrepreneurship Manual (2025) stated that a market opportunity is when there is an identified need or potentially favourable condition where the market is not fulfilling and meeting the customer's expectations. Due to increasing power outages, small-scale renewable energy systems are growing in South Africa. It is, therefore, an opportune time to participate in this market. The South African Energy Sector Report 2021 (DMRE, 2021b) stated that the Integrated Resource Plan (IRP) 2010 – 2030 was established because of the rising demand for electricity in South Africa and was forecasted to require frequent updates to align with the continuously growing demand for electricity. The DMRE further confirmed that it has since been revised to span until 2050. This plan accommodates investors and businesses that want to participate in the energy sector to supply the country's electricity demand (DMRE, 2021b). The involvement of the government makes it easy for these generators and customers to participate in the small-scale renewable energy market through Eskom's electricity infrastructure or off-grid.

The International Renewable Energy Agency (IRENA, 2020) forecast that South Africa will be able to supply 49% of its electricity through renewable energy by 2030. IRENA (2020) also recommended that South Africa should strive to realise the potential of embedded power generation – the small-scale renewable energy that Eskom intends to participate in. This confirms the security of supply that comes with Eskom Distribution's participation in the small-scale renewable energy market. Lawrence (2020) confirmed the opportunity of participating in renewable energy as he indicated that the generation costs of large-scale, unsubsidised utility-scale solar and wind power have significantly plummeted compared to fossil generation, to below coal and gas generation and capital costs. This means it is now relatively cost-effective to participate in the renewable energy market than before for both Eskom and the customers. This also means that if the power purchased by Eskom Distribution from the generators is affordable, the electricity prices can also be lower for the customers, and this will allow more customers to participate in the renewable energy market.

Lovins (2020) stated that small-scale electricity generation, also called DG, in which renewable energy is one of the sources of energy used, is not a new phenomenon as it was used in the initial stages of electricity generation and delivery which could only reach the customers local to the generation plant when electricity supply could not travel long distances. Eskom was the only electricity supply company in South Africa then and was therefore part of this strategy. The power produced closer to the customer remains cheaper than that from the central power stations because of the cost related to distance (Lovins, 2020). Eskom can bring power closer to the customers through the implementation of smart grids. Shaheen, El-Sehiemy, Kamel, Elattar and Elsayed (2021) explained that DG can be used in isolation from the grid (off-grid), supplying

the consumer's local demand, or it can be integrated within the network grid (grid-tied), supplying energy to parts of the electric system. Eskom can be involved in both instances of connection by taking part in the registration process of the installations, which will be explained in the upcoming sections of this chapter, which address policies and regulations guiding these processes.

According to Ogunsina et al. (2021), in the distribution systems, DG provides benefits for the customer and the utility, in this case Eskom, especially where it is practically impossible or extremely costly for the utility to transmit electricity. They further indicated that there has been a high level of uncertainty in the planning phase of DG in the past, and there are still opportunities to develop methods to be used to analyse and forecast the system behaviour. Distribution system planners and operators are using these opportunities to research the reduction of wasted energy (energy loss) and improvement of network services (quality of supply) while reducing costs (Ogunsina et al., 2021; Shaheen et al., 2021). Eskom's benefit from participating is in the work done by the planners and operators undertaking the research, which is also undertaken by the municipalities and other research organisations in the country. These research activities further increase the opportunities for Eskom Distribution to participate in the small-scale renewable energy market and increase employee training to increase the subject knowledge, which is still minimal.

As previously outlined, Eskom is expected to contribute to South Africa's commitment and pledge to reach net zero by 2050 as it is the largest emitter of GHGs in the continent of Africa; however, this transition must also address the country's triple challenge of poverty, inequality, and high levels of unemployment by sustaining the economy of the country (Pandarum & Mbam, 2023). There are projects like community shared embedded generation and community choice aggregation (CCA) from which Eskom will benefit as a utility. These projects allow Eskom to own and operate the renewable energy plant but ratepayers voluntarily participate and can sell back the purchased excess energy to their communities or back to Eskom (wheeling), thereby creating and generating revenue for themselves (Pandarum & Mbam, 2023). This will alleviate the strain on the electricity network that ultimately causes blackouts.

According to Eskom (2024b), there is an increase in the number of customers who generate and distribute their excess energy from their installed SSEGs to the utility. Eskom (2024b) further stated that this market of electricity generation allows the utility to purchase clean energy as part of the 2050 pledge. According to Oliver (2021), Eskom and the municipalities are increasingly taking responsibility for network infrastructure management and taking a leading role in influencing energy transitions to renewable energy. This is an opportunity for Eskom Distribution to source funding from financial institutions to implement renewable energy solutions while improving the state and performance of the network.

According to Steyn, Tyler, Roff, Renaud and Mgoduso (2021), R200 billion of the R400 billion of Eskom's debt cannot be serviced by their current revenue streams. This makes it difficult for South Africa's government to engage in other fiscal priorities as Eskom cannot profit and service its debt. Nkosi (2020) stated that Eskom constitutes about 75% of government guarantees. Identifying another revenue stream will enable Eskom to profit and service its debt. The alternative sources of electricity supply will also improve the reliability of electricity, thereby fulfilling customer demand.

The introduction of small-scale renewable energy for Eskom is the first step in changing technology, which will result in several benefits:

a) Reduction of carbon emissions (Eskom, 2023c).
b) Improved reliability of supply, thereby improving customer satisfaction and meeting electricity demand (Res 4 Africa Foundation, 2023).
c) Reskilling and upskilling the workforce for future renewable energy competition (World Bank Group, 2023)
d) Gaining an additional revenue stream (Energy Geoscience, 2024).

2.7 Eskom's opportunity and benefit in participating in disruptive technologies in the small-scale renewable energy market

Technology changes have been the core of evolving the power system from fossil to renewable energy, as mentioned in earlier studies. According to Mkhwebane and Ntuli (2019), South Africa first experienced a few installations of solar PV technology in the 1980s in rural areas where the communities were located far from the grid. Commercial installations emerged thereafter on small scales in the 1990s (Mkhwebane & Ntuli, 2019). Mahmud et al. (2020) noted that today, contemporary electricity networks and consumers are experiencing a momentous change from how conventional energy systems were designed and maintained to the new technology of electricity generation, transmission, and distribution. As a result of changing technology, a new definition of the small-scale electricity market emerged between the distributor and the consumer, as shown in Figure 2.4 below, which outlines the role of prosumers in the energy system's sustainability.

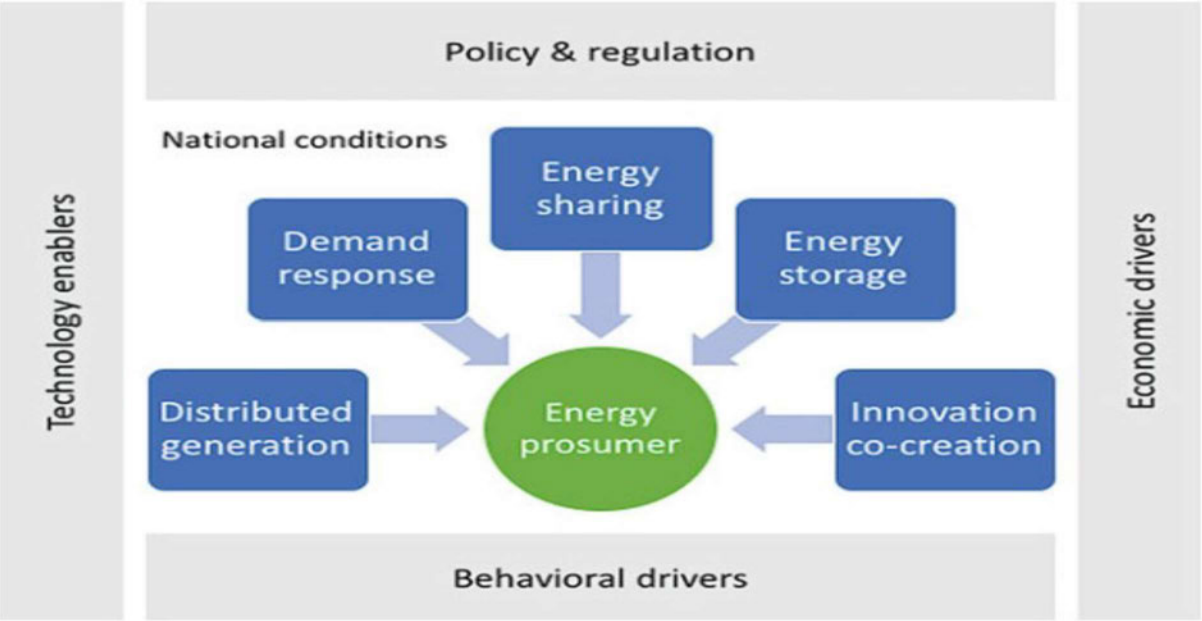


Figure 2. 4: Role of energy prosumers in the sustainable energy system *(Source: Kotilainen 2019: 1)*

The opportunities brought forth by the prosumers to Eskom Distribution are evident in the need for legalisation of their installation if they are connected to the grid (as shown in Figure 2.5 below – grid tied) and in terms of the utility's ability to buy excess energy to alleviate the constraint of demand side management (DSM) from Eskom Generation plants (Eskom, 2024b). In most cases, when the DG is off-grid (as shown in Figure 2.6 in Section 2.7 below – off-grid), this is in areas that are far from the grid and therefore are expensive to connect to the grid. Having prosumers in such areas reduces or removes the possible expense of reaching such communities and maintaining long-distance networks that have high energy losses. Eskom Distribution still fulfils the mandate to provide electricity for all and the commitment of the Just Energy Transition (JET) for a sustainable economy, job creation and no job losses, and accessibility and affordability of energy for all by supporting the process of legalising the prosumers.

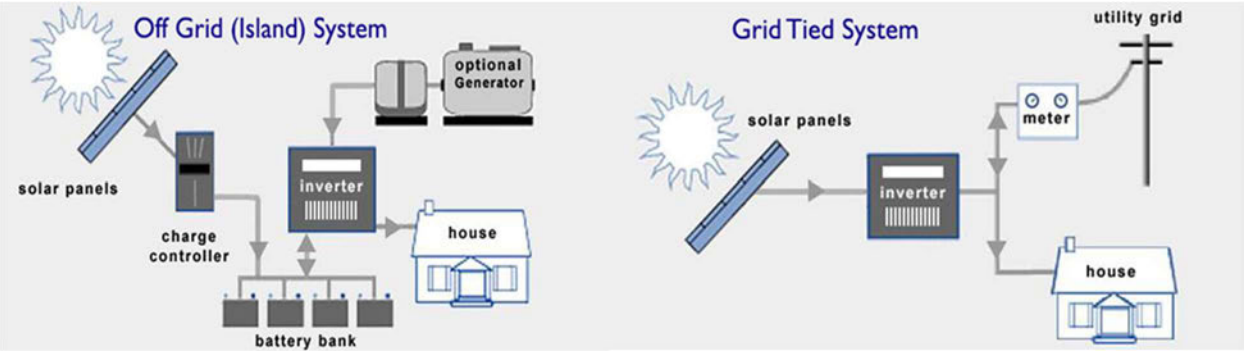


Figure 2. 5: Off-grid and grid-tied network configuration *(Source: Eskom 2024c, p.1)*

According to Hua et al. (2022), there are several challenges for prosumers in the power systems and energy markets, though they bring resolution to DSM:

- Energy pricing schemes and balancing instruments do not consider the behaviours of prosumers' energy exchange and therefore are not best suited to include the prosumers' role in the market.
- There is a rapid increase in information due to increasing amounts of DGs that cannot be managed by the current power system information infrastructure.
- It is difficult for small to medium prosumers to exploit historical data, due to inadequate budgets, to optimally schedule the generation and consumption of energy in line with the energy patterns.
- Accurate prediction of presumptive behaviours is a challenge due to the uncertainty created by the intermittent distribution of renewable energy and flexible demand.

As Eskom Distribution was required to legalise and register this segment of the small-scale renewable energy market, it must also support the participants to resolve the abovementioned challenges due to its experience and established systems that can be used to find resolutions. According to Hua et al. (2022) and Slama (2022), there are two resolutions to the challenges experienced by prosumers in the market: flexibility in the energy markets and intelligence in the operations of the power systems, which are supported by the new scientific innovations on the blockchain and artificial intelligence. They stated that the blockchain offers a platform to trade and technical support to decentralised energy markets, accessible and open to specific prosumers with enhanced privacy, security, and automation. Artificial intelligence operationally supports control systems for strategic decision-making to optimise system operations and achieve goals such as reduced electricity bills, improved generating profits, mitigating carbon emissions, and prediction of uncertainties in the energy system (Hua et al., 2022; Slama, 2022). This technology is not yet fully exploited in Eskom as part of the energy resolutions and improvement of the electricity grid and electricity provision.

Mahmud et al. (2020) stated that the smart grid is redefining the market of prosumers, forming VPPs by coordinating all types of prosumers through the IoE. Mahmud et al. (2020) and Yang et al. (2021) explained that a VPP is an advanced automated power plant that is a paradigm to manage Distributed Energy Resources, which combines numerous DGs, prosumers that have a demand-side management capability, and BESS to form an inimitable power plant. They stated that this involves an extraordinarily complex and high-tech infrastructure to communicate between distributed apparatuses to share and save energy. The IoE is designed to deploy more renewable energy sources that introduce energy storage devices usage at various

scales and levels, changing from a power flow that was traditionally unidirectional with a limited degree of autonomy to a bidirectional power flow (Mahmud et al., 2020).

Yang et al. (2021) mentioned that blockchain has been used in many industries as a trading platform. It attracts many interested participants because of its central attributes, providing anonymity, security and data integrity without the involvement of a third-party organisation that controls the transactions. He indicated that the VPP energy management platform, which is based on blockchain, facilitates a wealth of transactional energy activities amongst residential consumers with energy storage, flexible loads, and renewables in a VPP. He further stated that users can effectively network amongst each other for energy trading for mutual benefits and to provide network services, such as renewable energy feed-in, demand response, and reserves through the VPP.

The benefits of blockchain-based VPP to Eskom Distribution division are that the entity can increase supply of renewable energy to the distribution network and being part of the energy community will allow Eskom to tap into all the service suites available and, in turn, get support for the DSM, while the Eskom Generation Division is dealing with the long-term energy solutions. Eskom can also offer similar blockchain service suites to the grid-tied prosumers for them to have a wide range of options and an appreciation of connecting to the grid.

The disruptive technology is also bringing innovative ideas to Eskom Distribution, to compete or participate in other businesses besides selling electricity, such as the electric vehicle charging stations (eMobility) as part of the anchor market in the country (Eskom, 2023b). Eskom distribution, in its commitment to universal access in the electrification program managed by DMRE (now DEE), also installs microgrids in isolated villages such as Swartkopdam, which is 150km away from Upington, Northern Cape (Eskom, 2023c). This is one of the three Eskom Distribution microgrids that are installed off-grid so far, in areas that are almost impossible to electrify into the grid due to excessive cost and long distances to the grid connection points (Eskom, 2023c). Microgrids range from 100 kW up to multiples of MW (Centre for Climate and Energy Solutions, 2024). There is an opportunity to hand over these microgrids to the communities to be managed as off-grid prosumers, where the communities can find support, such as blockchain-based trading platforms, since they are off-grid, to manage the microgrid as a business. This is an opportunity that Eskom Distribution can extend in the formation of VPP as the installations of microgrids multiply around the country.

2.8 Challenges for Eskom in participating in the small-scale renewable energy market

Jain and Jain (2017) indicated that at the end of 2007, South Africa experienced an immense power crisis and could not fulfil its electricity demand. They further indicated that this was as a result of an increase in

the demand for electricity supply due to population growth, rising economic activities, an increase in the housing built by the government for indigent communities, and lack of Eskom plant maintenance and plant expansion for future growth due to insufficient funding from the government.

According to Jain and Jain (2017), the solution to this crisis is the implementation of renewable energy sources. They stated that the potential for renewable energy sources in each province differs from one another. Baker (2017a) explained that successful projects sell their renewable energy power to Eskom through the 20-year PPA, which is supported by the government and dominated by local currency. He further stated that due to tight financial requirements for these projects, local manufacturers and suppliers are unable to participate in this market. Therefore, the industry is dominated by foreign or international companies, which defeats the purpose of implementing just energy by increasing job opportunities, energy security, and affordability, as this does not occur locally for people within South Africa. Eskom, as the main player in this market in South Africa, is expected to drive change that will make this market accessible to the local generators (prosumers).

Baker (2017a) indicated that the Eskom transmission and distribution grid capacity to integrate renewable energy as an alternative generation source is another challenge. Eskom is expected to strengthen the network and upgrade the substations to enable the IPPs to connect their projects. However, he explained that Eskom has indicated that it will be a challenge to connect IPP projects where the grid is not stable or is not capable of handling new loads due to funding constraints for grid upgrades and strengthening. It is forecasted that for some time, the renewable energy sources will compete to be connected to the same line that has capacity (Baker, 2017a). The Eskom Distribution network is constructed similarly to Transmission; therefore, it experiences the same constraints and has the same strengthening requirements. Figure 2.6 below shows an even more threatening view of the future network, especially at the Eskom Distribution level, where the supply is meshed and no longer single-directional. This requires a resilient network that is flexible to technological changes. There is a great deal of work yet to be done with the current state of the Eskom Distribution network to prepare it for the coming challenges.

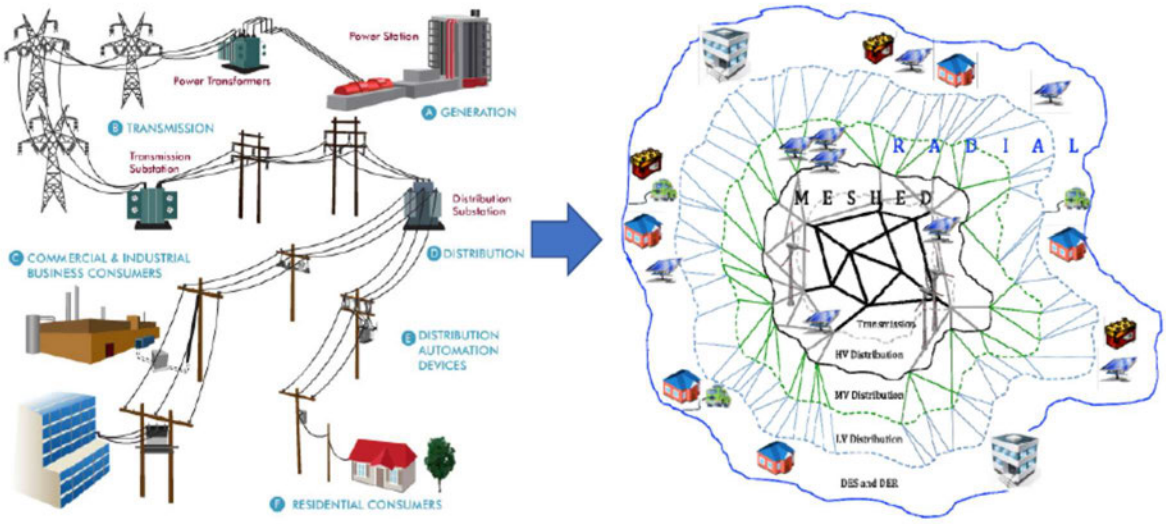


Figure 2. 6: Future changes in the electricity networks *(Source: Eberhard 2018: 19)*

Eberhard (2018) indicated that the power sector will change even more radically in the next ten years. Eberhard (2018) noted that these changes will be overwhelming for current business models and will require intense finance for the traditional utilities such as Eskom. According to Eberhard (2018), the electricity sector and the customer market are no longer a monopoly as there are multiple generators of electricity emanating from renewable energy sources, and customers have a choice to choose a supplier. He further mentioned that electricity distribution is a separate business from retail, unlike before, when it was one, which allowed Eskom to control the market.

According to Mohlakoana et al. (2023), addressing energy poverty is about increasing access to reliable, safe, and affordable electricity. This puts pressure on Eskom Distribution to find a resolution to satisfy the customers that remain connected to the Eskom Distribution network with reliable, safe, and affordable electricity from any source of supply, especially small-scale renewable energy generators that are proven to cost less than the coal-generated electricity.

2.9 Policies, policy instruments, and regulations governing renewable energy

Electricity generation and delivery are core to the growing economy in any country, and this is true for South Africa as well. This makes the electricity crisis and global warming challenges in South Africa a government or countrywide crisis. Based on this view of the pressing need for increased, reliable energy generation, this study focuses on how the government of South Africa and relevant structures can participate in finding a resolution to energy challenges in the country. Eskom, as a government entity, works within

the laws that govern the country; hence, a review of policies, regulations, and other related documents and structures is important in this research. This review of specific policies and relevant literature will be presented in the sections to follow.

2.9.1 South Africa's energy policy

The planning and development of the energy policy is led by the Minister of Electricity and Energy through the DMRE (now the DEE) with role stakeholders such as Eskom representing the three electricity divisions (Generation, Transmission, now called National Transmission Company of South Africa – NTCSA, and Distribution) and the IPP office responsible for procurement of renewable energy and other sources of clean energy (Cunliffe, 2023). The White Paper on Energy Policy was released as a first issue post-apartheid in 1998, which introduced IPPs and encouraged diverse energy sources in the grid and off-grid (Cunliffe, 2023). The White Paper presents five key objectives, which are: increased affordable energy services access to the poor; improved governance of energy; economic development stimulation; management of environmental impacts related to energy; and diversifying electricity supply for security of supply (Urban Energy Support, 2024). The involvement of Eskom in the development of this policy ensures that electricity supply-related technology development, innovation, and leadership commitment profoundly contribute to supporting South Africa to take part in the reduction of GHGs and other related environmental impacts by implementing the objectives of the policy (Eskom, 2024a).

2.9.2 South Africa's Renewable Energy Policy

The first release of renewable energy policy was presented in the South African Government Gazette 2004 *White Paper on the Renewable Energy Policy of the Republic of South Africa* by the South African Deputy Minister of Minerals and Energy, which outlined government objectives, principles and goals of renewable energy, and established government's enabling activities that will ensure that renewable energy is a significant part of South Africa's energy portfolio (Government Gazette, 2004). In the United States of America, like South Africa, and in countries like Colombia, India and Indonesia, policies are used to drive renewable energy projects such as renewable energy feed-in tariff (REFIT), renewable portfolio standards, transmission standards, and many others to address implementation barriers (Cunliffe, 2023; US Department of Energy, 2024). Eskom's involvement in this policy emphasises the need for Eskom to participate in the implementation of renewable energy, as it is the core solution for South Africa to mitigate energy-related challenges, such as carbon emissions and other energy crises, such as load shedding. A climate policy implementation check was developed in 2022 as an analysis tool that is used to assess the implementation of the policies that are meant to achieve decarbonisation and evaluate the implementation of energy transition policies by countries like South Africa (Cunliffe, 2023).

2.9.3 South Africa's carbon pricing and climate mitigation policy

The South African Carbon Pricing and Climate Mitigation policy, published in 2023, aims to support South Africa's economic growth, promote low-carbon reserves, and raise government revenue. This policy stresses effective carbon pricing policy usage, reduction of inefficient government subsidies delaying the JET, and other green finance and sector measures (Qu, Suphachalasai, Thube & Walker, 2023).

The Carbon Pricing Assessment Tool is another analysis tool used to simulate the effects of the proposed carbon tax rates setup. Considering the present tax proposal setup, which is $30 (about R600) per ton by 2030, the Carbon Pricing Assessment Tool simulation outcome shows an estimate of above 3.3% consumption by the poorest South African household, and 2.1% for the rich (Qu et al., 2023). This forecast implies that the carbon tax increase will be a setback for South Africa in the pursuit of inclusive economic growth and government profits improvement. Eskom's involvement in the carbon pricing policy will ensure that it lowers carbon emissions to prevent the increase of carbon tax rates as proposed, especially to protect the low-to-medium income households that must ultimately be part of the renewable energy market, whether by moving their renewable energy supply from the grid (via IPPs) or from small-scale renewable energy generators. There is also an opportunity to establish incentive schemes for consumers who are improving their carbon footprint.

These existing policies discussed above are a guide to effectively managing the implementation of renewable energy, whether large or small-scale, though they are primarily geared toward large or utility-scale renewable energy generation.

2.9.4 South Africa's Just Energy Transition (JET) policy and pillars

In 2022, the licensing threshold for energy generation facilities was removed when Schedule 2 of the Electricity Regulation Act was amended (The Presidency – RSA, 2023). This change in the regulation has allowed all sizes, including small-scale, of energy project investments to grow rapidly, especially in renewable energy sources (The Presidency – RSA, 2023). La Camera and Müller (2020) stated that inclusive policies to enforce decarbonisation transformation can be used to drive socio-economic development through JET, whereby social, environmental, and economic goals would be aligned with long-term energy transition, which includes an equitable share of energy transition costs.

The JET policy subscribes to the United Nations' 17 sustainable development goals (SDGs) (UNDP, 2024; WHO, 2024) that aim to ensure that the transition to renewable energy sources neither leaves people destitute nor harms the environment or the economy of a country. Instead, these indicators must improve during the transition as a country strives to achieve sustainable and low-carbon energy in the future while maintaining the principles of inclusivity, equality, and fairness (Inogen Alliance, 2023). The just transition

policies as set out in the South African National Development Plan prioritise people's wellbeing amid the response to climate change while forecasting a low-carbon future integrated in South Africa's development journey map (The Presidency – SA, 2023).

In the 2024 State of the Nation Address, the President of South Africa indicated three priority areas as identified by the Just Energy Transition Partnership (JETP), where electricity is one of these priorities, as it is the single most significant contributor to GHG emissions (Republic of South Africa, 2024). The President also stated that there are 5 key pillars for the energy action plan, and three of them directly involve Eskom. These are: (i) fixing Eskom and improving the availability of the current electricity supply; (ii) speeding up the new generation capacity procurement from renewables, battery storage, and gas; and (iii) transforming the electricity sector to achieve long-term energy security.

Eskom has a plan to develop 8017 MW of renewable energy projects of different renewable energy sources to transition to green energy, which will cost about R146 billion (Republic of South Africa, 2024). The license threshold for new embedded generation projects was augmented from 1 MW to 100 MW in 2021 and completely removed in 2022, which enables the private generators to produce and sell electricity to multiple customers of small to medium businesses, such as data centres, factories, and mines. Thus far, this has opened opportunities for more than 80 confirmed private sector projects, which equate to a capacity of greater than 6,000 MW (Republic of South Africa, 2024). The augmentation of the threshold for embedded generation provides Eskom Distribution with opportunities to support the small-scale renewable energy generators to grow towards utility-scale renewable energy as they contribute to the South African pledge and mandate to produce low-carbon electricity and to create more jobs to alleviate poverty.

2.9.5 South Africa's small-scale renewable (embedded generation) energy regulations

There were two challenges related to the small-scale renewable energy projects that were identified in the early implementation stages of small-scale renewable energy generation, which needed to be resolved (Energypedia, 2014). The first was acquiring a generation license from NERSA, which was going to be cumbersome for NERSA due to the number of small-scale renewable energy projects, unless the then Minister of Energy excluded some technologies, such as solar PV, for licensing. It was deemed to be better to establish a small-scale generation license to monitor connections to the grid from renewable energy projects. The second challenge is related to defining the municipality and Eskom Distribution's roles and obligations in the connection of small-scale renewable energy projects. Municipalities would largely have most of these projects, as most urban customers are connected to their distribution network. Establishing a process would simplify and support the management of small-scale renewable energy, especially considering safety when importing the excess electricity back to the grid.

The South African Local Government Association (SALGA) (2018) stated that to establish a resolve on the regulation challenges for small-scale renewable energy generation, the Distribution Code as approved by NERSA and written per the Electricity Regulation Act 2006 was established, and it applies to all users of the distribution system, including all licensed distributors. They further stated that it allows the customer to apply for a connection to the distribution system to use or to sell back excess electricity generated using SSEGs. Eskom, like the municipalities, as a licensed distributor, is obliged to connect embedded generators and other customers to Transmission and Distribution electricity systems using PV plants, and the process is supported by a grid connection code for Renewable Power Plant published by NERSA (SALGA, 2018).

2.9.6 Energy policy enablers in South Africa

2.9.6.1 South Africa's Integrated Resource Plan (IRP)

The IRP of 2023, a revision of the 2010 and 2019 versions, is an electricity planning central policy instrument published in 2024 by DMRE, which is a key enabler in the implementation of electricity reform and transition in the electricity sector. It provides a revised South African electricity plan which includes a technology mix and the diversified new build generation capacity up to the year 2030 (Cunliffe, 2023; DMRE, 2024b). The IRP 2023 forecasts that there will be a rise in the installation of small-scale renewable energy (embedded generators) due to load shedding and increasing electricity pricing (DMRE, 2024b). The rise in installation of SSEGs should not be used for load shedding or rising electricity prices, but should be linked to the strategy for decarbonisation, energy security, and expansion of new energy sources and demand, such as new energy vehicles and green hydrogen, as indicated in the IRP 2023. The interest in Eskom Distribution to participate in the small-scale renewable energy market is for the latter reasons that are more sustainable, besides making a profit. The IRP revolves around Eskom improving the current electricity supply situation and further invites more participants, like IPPs, private businesses, and the public, to take part in resolving the South African electricity crisis and to drive its commitment to reducing carbon emissions.

2.9.6.2 Renewable energy feed-in tariff (REFIT) for small-scale renewable energy

REFIT is a policy instrument that was commissioned by NERSA in 2009 to regulate renewable energy electricity tariffs in South Africa (Ayamolowo et al., 2022). Energypedia (2015) indicated that this regulated development is meant to broaden the competition space of electricity generation, which was approved by the government of South Africa. They further stated that Eskom is appointed as the Renewable Energy Purchasing Agency with a Single Buyer Office that will buy electricity from qualifying renewable energy generators, at the Transmission or Distribution level of electricity supply. The PPA between Eskom and the

renewable energy generators is for 20 years from its approval in 2009 (Ayamolowo et al., 2022; Energypedia, 2015).

Energypedia (2015) argued that in 2015, small-scale renewable energy projects were not included in the REFIT, though there was already interest from non-governmental organisations, the private sector, and general citizens. They indicated that this was due to the required generation license for all energy generators, which posed a burden to small-scale renewable energy generators unless a license specific to small-scale generators was established. According to Greencape (2020), small-scale renewable energy has 9% of installed electricity capacity in South Africa, with 3.9 GW of operational small-scale renewable energy projects. There is a growing opportunity in this sector to expand the implementation of renewable energy in South Africa. With a policy tool like REFIT regulating the industry, there is guided execution of these small projects to protect the utilities, which are Eskom and municipalities, as well as legalising or qualifying the small-scale renewable energy generators (Greencape, 2020).

2.9.6.3 Eskom standard offer

In 2023, Eskom launched the cross-border standard offer programme to purchase energy from cross-border utilities and IPPs on a short-term basis, which is meant to boost the energy generated from the grid for South Africa (SANews, 2023). The standard offer further enables Eskom to procure additional energy to the Eskom grid from renewable energy generators that generate excess energy from their plants (Eskom, 2023d). Two pricing models are available for the offer, and the generator must make their choice at the beginning of a three-year contract (PPA), which is reviewed annually (Eskom, 2023d).

The static price structure runs within the Eskom financial year, which is from April to March of the following year. It is based on the approved regulatory cost recovery and covers the variable generation cost. The static price structure shows the time-of-use structure that is approved by the Eskom board, whereby the price is determined yearly and published in February every year. **The dynamic/variable price structure** is determined on a day-ahead basis, on hourly intervals prescribed by the rules of the Eskom Dynamic Energy Market. The generator is provided the price on the previous day in the afternoon, capped at R1093.20/MWh. SANews (2023) indicated that this programme will alleviate the power supply constraints in South Africa and reduce the effect of load shedding. The benefit for Eskom to negotiate a standard price is that it can determine savings from the price it would have paid if energy were from the conventional generation source (avoided cost) (SANews, 2023).

2.9.6.4 Eskom Distribution's leadership role in implementing small-scale renewable energy

Mangisa, Schultz, and Van Hoek (2020) argued that leadership is not about authority over others but certainly about influencing others to reach new altitudes, stay motivated, and excel beyond expectation.

Ramjeeth and Mutambara (2022) indicated that crisis leadership requires diverse and distinctive leadership traits. They further stated that ineffective leadership response in a crisis can cost the organisation financially, in the market, and in employee turnover. Eskom's leadership role is to ensure that employees are committed to the vision and exceed their expected performance when executing their duties. Hendrickse (2022) argued that leaders can be authentic only by being role models to their followers through their actions, commitment, value-add, and driven vision in the organisation. Eskom requires leaders in the organisation who will drive action, dedication, and execution of the vision to participate in the small-scale renewable energy market. Barwick (2023) argued that a team is as strong as the person who leads it, and effective team leadership is essential in leading a successful team. He further indicated that an organisation that lacks effective group leadership soon finds itself behind its competition.

As Eskom embarks on the competitive arena, strong team leadership is required to establish teams that perform purposefully. Hunsaker and Knowles (2022) stated that the leader's attitude drives a combined belief about the need for change and a passion for improvement that successful change brings, as achieving change is more complicated than remaining the same. Kotter (2021) indicated that to make change stick, the leader must connect the expected new behaviour with the organisation's success and ensure that old behaviour ceases to exist.

Daft and Lane (2018) stated that leaders have had their assumptions to make the organisations succeed as they struggle to make sense of the changing workplace while effectively and successfully leading people in times of crisis. Islam, Furuoka, and Idris (2021) stated that in the process of change, employees are fearful, disengaged, burned out, and show unwillingness to be involved.

Men, Yue and Liu (2020) indicated that in an increasingly evolving and adaptable work environment, leaders face enormous challenges to gain and maintain trust from employees in their organisations. They further stated that organisational executive leaders are expected to be frontiers, decision-makers, disorder managers, spokespersons and enablers, communicators and chief engagement officers. Figure 2.7 below shows the key elements of what leadership entails, which is power to influence, and it occurs amongst people who desire significant beneficial changes, which are shared by both leaders and followers (Daft & Lane, 2018).

Figure 2. 7: What leadership entails *(Source: Daft & Lane, 2018: 5)*

Baker, Hook and Sovacool (2021) indicated that over the years, the governance, ownership, and regulation of the electricity sector were a focus of an old debate between the leaders supporting a state-owned monopoly and those that supported market liberalisation. They further indicated that the debate focused on the central electricity system of generation, transmission, and distribution, produced through hydroelectric, nuclear, and thermal sources of energy that greatly showed the political struggles of that era between pro-market, which favours a market economy that is ruled by the government, and the nonconformist autonomy economic methods. The leadership debate, in summary, presented an open electricity sector that is efficient and competitive, compared to a state-owned electricity monopoly that is over-subsidised, resists innovation, and is exposed to corruption (Baker et al., 2021). Currently, the debate amongst leaders is to do with finding resolutions to effectively mitigate climate change, which requires engagement between government and

non-government leaders at different levels of governance to swiftly and sustainably reduce GHG emissions (Tosun & Shyrokykh, 2024).

Ting and Byrne (2020) indicated that Eskom emits 43% of South Africa's GHGs and therefore faces pressure to find a resolution to ensure low carbon emissions, which can be achieved through increased reliance on renewable energy sources. They indicated that layering is an option to consider adding on to existing rules that will co-exist and not undermine the rules already in place around current technology. In Eskom's case, current technologies relate to fossil-related technologies, but layering will support the improvements to resolve challenges caused by current technological rules. These technological rules are selected and filtered considering sociological, cultural, material, and political dimensions by leadership and are locked in once adopted through written processes and procedures (Ting & Byrne, 2020). Rambe and Modise (2016) argued that the great energy crisis that surrounds South Africa is ascribed to the perceived weak Eskom leadership and diminishing locus of control between management and employees. Yelland (2020) and Ting and Byrne (2020) also concur with the presumption that Eskom and the municipalities had no appetite to implement the multi-level perspective of transitioning from fossil to renewable energy technology, and therefore, they view this act as regime resistance.

Zondo (2021) emphasised that Eskom is mandated by the shareholder agreement with the Department of Public Enterprises to deliver on seven key government objectives, one of which is to reduce the impact on the environment, and the other is to take responsibility for changing the energy landscape in South Africa. Ibrahim et al. (2021) stated that South Africa is moving in the right direction with renewable energy. They further stated that the benefit of renewable energy is realised when supported primarily by leadership in the government, labour unions, societies, and private businesses, with benefits such as economic improvement, attraction of investors, job creation, and technology improvement, which is the responsibility of Eskom leadership.

Eskom Distribution's leadership is empowered by the utility's role in the country to influence decisions to simplify the processes to legalise or register the small-scale renewable energy generators and prosumers that are off-grid or grid-tied. According to the studies reviewed in this research, an increase in the number of prosumers will provide Eskom Distribution with an increase in energy capacity and reduced energy loss as the distance from the source (generators) will be much less. The policies discussed above imply that the decision to implement the renewable energy tariff for affordable connection charges is dependent on Eskom Distribution's leadership, as piloted by the organisation. It is anticipated that when Eskom Distribution purchases energy from the small-scale renewable energy generators at low cost, it will, in turn, consider selling it at a lower price than the current one to all consumers to provide South Africans with affordable

electricity. The success of the implementation of small-scale renewable energy lies in the strengthening of the Eskom distribution network to be able to accommodate the feed-in energy from the prosumers. Eskom Distribution's leadership needs to source investors to implement the required projects and to empower the engineering teams to explore and find resolutions facing the new system, where problems may be encountered as the flow of electricity is expected to be bidirectional.

2.10 Conclusion

This chapter has laid the foundation for establishing the significance of Eskom Distribution to participate in the small-scale renewable energy market. Eskom Distribution must take the lead in influencing decisions to define simpler processes and tariff structure changes that will ensure a speedy installation of small-scale renewable energy generators in South Africa to support clean energy generation. There are many opportunities that Eskom has in participating in the small-scale renewable energy market, such as connecting more grid-tied small-scale renewable energy generators to the Eskom distribution network to offer them a stable charging point at a relatively lower price. Eskom also has opportunities to participate in the smart grid implementation of VPPs, where remote communities can be electrified via the smart grid. There is an even better benefit, more than an opportunity, in the installation of smart grids, in that Eskom does not need to spend excessively on grid expansion to reach the outskirts of the country, and is still able to provide the services required in such places. The challenges, as mentioned in the chapter, are that the renewable energy policies were not inclusive of the small-scale renewable energy market, and there is still room for improvement. Looking at Eskom Distribution, the tariff structure still does not include the small-scale renewable energy market segment. The advantage of Eskom's ability to establish a pricing structure provides an opportunity for Eskom to define how to purchase the excess energy from the small-scale renewable energy generators and other generators, which provides great savings benefits for the parastatal. This change remains a good opportunity for Eskom Distribution to reduce carbon emissions and expand the mix of energy sources. The next chapter will outline the research design and elaborate on the data collection and analysis methods employed in the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter focused on the literature relevant to the significance of Eskom Distribution's participation in the small-scale renewable energy market. This chapter will focus on the research methodology that was undertaken to achieve the study objectives. Research promotes knowledge progression, assisting in modernising society, and it encompasses creative work performed systematically, thereby increasing the knowledge base of humans, culture, and society to formulate new claims (Verma, Verma & Abhishek, 2024). This chapter will examine the research paradigm, research approach, and research design that guided the researcher in undertaking the research. The sampling method used to select the participants included in the study, and the data collection instrument and data analysis method that were employed in the study to explore the topic of Eskom's small-scale renewable energy project participation will be discussed. The ethical considerations and the measures used by the researcher to ensure that ethical guidelines were adhered to will be outlined, and the chapter ends by considering how the trustworthiness of the research findings was ensured in the research process.

3.2 Research paradigm

Kivunja and Kuyini (2017) stated that the research paradigm is a researcher's 'worldview', which is the beliefs, thinking, perspective, or school of thought that explains the research data. They further say it is the 'conceptual lens' with which the researcher scrutinises their methodology (Kivunja & Kuyini, 2017). The selected research paradigm allows the researcher to define the research methods to be used as well as the method of data analysis. Rahi (2017) and Creswell and Creswell (2018) describe the four research paradigms as follows:

Positivist paradigm – which is referred to as quantitative, empirical science, post-positivist research, whereby the researcher believes in obtaining knowledge through experiment and observation.

Interpretive paradigm – which is also called constructivism or qualitative research, whereby the researcher has an interpretive belief that the subject's true knowledge can only be attained through profound interpretation and discovers the understanding of the world they live in, subject to their experiences, and directed to certain things. The research relies heavily on the participants' views of the topics under scrutiny in the study.

Advocacy and participatory paradigm – also known as a critical paradigm that relates to qualitative research, whereby the researcher believes that the review must be intertwined with social and political

matters, with a political agenda that aims to change the participants' lives, the researcher's life, and the institutions in which they work or live.

Pragmatism paradigm – comes from situations, consequences, and actions, instead of original conditions. This paradigm uses a mixed-methods approach for the research, which focuses on finding the weaknesses in the study and strengthening it. In this case, problem-solving is more important for the researcher than the research method used. Hence, he/she uses all available methods, qualitative and quantitative, to define the problem statement.

The researcher's worldview for this study is interpretivist, as it is in line with the precepts of qualitative research, which relies heavily on interpreting the participants' views related to their experience regarding the overall topic under investigation in the study. The researcher conducted interviews in line with an interpretivist worldview, where interviews were conducted with the Eskom management employees to ascertain their views and opinions regarding the significance of Eskom Distribution in participating in the small-scale renewable energy market. A qualitative research approach was used to explore the participants' experiences and perspectives related to the significance of the small-scale renewable energy market for Eskom.

3.3 Research approach

According to Creswell and Creswell (2018), qualitative research investigates attitudes and behaviour and comes with complete variables. Ramanadhan et al. (2021) stated that the qualitative research approach generates opportunities to analyse complexity and include a range of perspectives for the implementation of the research. Qualitative research is achieved through a series of interview questions posed to participants, where data is collected and analysed to give an idea of necessary action or change (Creswell & Creswell, 2018). A set of questions (Appendix D) was used to interview the participants drawn from Eskom Distribution management. The questions explored the managers' awareness of other business interests that Eskom Distribution is embarking on. The leadership's involvement in driving change and the expansion of business to other sources of energy was also explored. The managers were asked about the possible benefits for Eskom in participating in the small-scale renewable energy market.

The qualitative research approach was appropriate for this study because the managers' experience of finding other means to generate and sell electricity is fairly recent in Eskom, and their understandings therefore bring a new phenomenon to light in terms of the existing knowledge base. There is limited information relating to Eskom's participation in the small-scale renewable energy market; thus, using a qualitative research approach presents an opportunity to engage those who are involved in defining and deciding what it means to Eskom, which is in line with the interpretive paradigm. Qualitative data was

collected through semi-structured interviews, and the data was analysed to understand the significance of Eskom participating in the small-scale renewable energy market.

3.4 Research design

Creswell and Creswell (2018) mentioned that research design is a plan and procedure for research that emanates first from comprehensive assumptions and proceeds to detailed data collection and analysis methods. They further indicated that there are a number of decisions taken in formulating this plan, and the overall decision is to choose a design to be used for the study of the topic under research, which is informed by the worldview and assumptions of the researcher. These decisions entail choices regarding strategies of inquiry, specific data collection methods, data analysis techniques, and modes of interpreting the findings. The research design selection is also based on the type of research problem under study, the personal experiences of the researcher, and the study audience (Creswell & Creswell, 2018). According to Rahi (2017) and Creswell and Creswell (2018), there are three types of research: qualitative, quantitative, and mixed methods, and they have key research strategies: ethnography, grounded theory, case studies, narrative, and phenomenological research.

Muzari, Shava and Shonhiwa (2022) stated that qualitative research is derived from constructivist theory, which claims that knowledge is subjective as it is drawn from varying perceptions of people in the environment. This qualitative research is based on narrative research where the author recognises the core of human lived experiences about the study as narrated by the participants, which is in line with the author's interpretive worldview that was used to study a small number of participants selected using purposive sampling (Rahi, 2017; Muzari, Shava & Shonhiwa, 2022; Creswell & Creswell, 2018).

The qualitative research approach assumes that an individual represents a group's emotions and experience (Creswell & Creswell, 2018); hence, the interviews with Eskom Distribution managers were taken to represent their organisation and their teams' views.

3.5 Sampling method

Basti and Madadizadeh (2021) stated that it is time-consuming and almost impossible for a researcher to study an entire population; therefore, it is best to follow an efficient sampling method. Owusu Sarfo et al. (2022) said that a sample is a portion that represents a large population, and sampling is the process of acquiring this portion from a population. Basti and Madadizadeh (2021) noted that purposive sampling is when the researcher uses experienced people suitable for the study. This non-probability sampling method is low-cost, less time-consuming, and easy to execute (Basti & Madadizadeh, 2021). Purposive sampling is the sampling method used for this study, which is Eskom Distribution managerial employees who are

directly involved in the testing of technology and in decision-making regarding Eskom's participation in the small-scale renewable energy market. Memon et al. (2023) indicated that using inappropriate sampling techniques results in inefficient data collection; therefore, deciding on the appropriate sampling technique is crucial to obtain relevant data in line with the research paradigm and design adopted. Using a purposive sampling technique, participants in this study were selected from whom relevant data to meet the study's objectives would be acquired. Hence, for this research, Eskom Distribution management employees from the Central East Cluster were chosen to be interviewed.

3.5.1 Study site

The study site for this research is Eskom Distribution Central East Cluster, which is made up of the FS and KZN provinces. Eskom Distribution is one of the three main Eskom Divisions, along with Generation and Transmission, and the fourth one is the Corporate Division, where all the central support services to the three divisions reside. The hierarchy of leadership in Eskom is from the highest office, which is the Chief Executive Officer, and each division has a Group Executive. Eskom, as a holding company, has a board of company directors. Each of the three divisions has its own board of directors. This structure was introduced in preparation for the unbundling that was finally implemented in the Transmission division on the 1st of July 2024, as mentioned earlier in this study. Eskom will remain the holding company for the three divisions beyond unbundling, as it has confirmed that even the current debt and bonds will remain with the holding company after unbundling (Eskom, 2022a).

Eskom Distribution has five Clusters, of which Central East is one. Eskom Distribution was chosen as the study site due to the ease of access to the participants, considering the purposive sampling chosen for this study, as the author resides in the KZN province of the Central East cluster, which made access to participants and collection of data simpler and cost-effective. The study focused on Eskom Distribution due to the division's capability to connect small-scale renewable energy generators rather than large-scale renewable energy generators, which are more suitably connected to the Transmission and Generation networks.

3.5.2 Target population

Willie (2023) indicated that the population refers to a complete group of persons that have common characteristics. He further indicated that it comprises the larger, comprehensive group that is the focus of a study or analysis, while the target population refers to a specific subgroup within this larger population, which is the primary study focus, and it represents a smaller group of persons who hold specific characteristics. The target population for this research was Eskom Distribution Management, referred to as MPG Band (Managers, Professional Senior Engineers, and General Senior Advisors), comprising non-

bargaining employees involved in the SSEG project. The population size of managers involved in Central East Cluster SSEG projects is 50, with 16 in FS and 34 in KZN.

3.5.3 Sample size

A sample of 20 Management employees (a selection of ten in each of the two provinces) from Asset Creation, Customer Services, and Maintenance and Operations departments in FS and KZN were interviewed. The management employees from Eskom Distribution, Central East Cluster, which is a merger of FS and KZN provinces that are involved in the small-scale renewable energy project, were the only participants that were included in the interviews. No secondary data was needed for the study. Table 3.1 below illustrates the demographics of the participants:

Table 3. 1: Participants' demographics

Pseudonym	Province	Department	Position Grade	Position description	Gender	Race	Age group
Participant 1	Free State	M&O	P18	Chief Engineer Professional, M&O	Male	White	>60
Participant 2	Free State	AC	P16	Senior Engineer Professional, Grid Planning	Male	White	50 - 60
Participant 3	Free State	CS	M18	Middle Manager, Customer Relations Management	Male	Coloured	50 - 60
Participant 4	Free State	M&O	M18	Middle Manager Specialised Maintenance and Support	Female	Black	40 - 50
Participant 5	Free State	AC	M16	Manager, Network Engineering and Design	Male	Black	40 - 50
Participant 6	Free State	M&O	M18	Middle Manager, Network Optimisation and Support	Male	Coloured	40 - 50
Participant 7	Free State	M&O	M18	Middle Manager, Zone Management	Male	Black	40 - 50
Participant 8	Free State	CS	M16	Manager, Customer Relations Management	Female	Black	50 - 60
Participant 9	Free State	CS	G15	Senior Advisor, Key sales and customer services	Male	Black	40 - 50
Participant 10	Free State	AC	M16	Middle Manager, Network Engineering and Design	Male	Indian	40 - 50
Participant 11	KZN	M&O	M18	Middle Manager Specialised Maintenance and Support	Female	Black	40 - 50
Participant 12	KZN	M&O	M16	Manager, Sector Management	Male	Black	30 - 40
Participant 13	KZN	M&O	M18	Middle Manager, Zone Management	Female	Black	40 - 50
Participant 14	KZN	AC	M18	Middle Manager, Network Planning	Female	Black	30 - 40
Participant 15	KZN	AC	M18	Middle Manager, Network Engineering and Design	Male	Black	40 - 50
Participant 16	KZN	M&O	P16	Senior Engineer Professional, Plant Performance	Female	Black	30 - 40
Participant 17	KZN	CS	M18	Middle Manager, Marketing	Female	Black	40 - 50
Participant 18	KZN	CS	M16	Manager, Pricing and contract management	Female	Indian	40 - 50
Participant 19	KZN	AC	P16	Senior Engineer Professional, Standards Implementation	Female	Indian	30 - 40
Participant 20	KZN	CS	G15	Senior Advisor, Demand Side Management	Male	Indian	40 - 50

Legend:	KZN = KwaZulu Natal
	AC = Asset Creation department
	CS = Customer Services/Retail department
	M&O = Maintenance and Operations department
	M18 = Task Grade for Middle Management position
	M16 = Task grade for first line Management position
	P18 = Task grade for Chief Engineer position
	P16 = Task grade for Senior Engineer position
	G15 = Task grade for generalist and/or senior advisor position

The Maintenance and Operations department is the majority employer in Eskom Distribution and therefore has more employees than the other two departments. It is for that reason that more Maintenance and Operations management employees were interviewed than the other two departments.

3.6 Data collection

Bandhari (2022) indicated that data collection is a systematic process of gathering observations or measurements, allowing the researcher to gain first-hand insight into the research problem. The target population was the Eskom Distribution management employees, and the framework was Managers, Specialists, and Senior Advisors involved in implementing the Eskom small-scale renewable energy project. Data was collected using semi-structured interviews and the findings of the study were generated from the transcripts and recordings conducted with 20 managerial employees identified through purposive sampling. The interviews were conducted virtually via Microsoft Teams, which saved time and travelling expenses. The virtual interviews also allowed the participants to choose their own suitable time, which in most cases was after work, at their own convenience in terms of the day, time and place (some interviews were conducted during the weekend). Fusch and Ness (2022) emphasised that not getting data saturation impacts the quality of data collected for the research and compromises the validity of the information collected. Data saturation was reached with the sample of 20 interviews, as it was spread amongst homogeneous Eskom managerial employees.

3.7 Semi-structured interviews

Naz, Gulab and Aslam (2022) stated that an interview is an effective strategy to attain qualitative research data as it assists in explaining, understanding and exploring research topics, behaviour, experiences and opinions, to narrow the research portion that the researcher intends to discover as she listens to the participants involved in a dialogue. These authors stated that structured or semi-structured interviews are effective tools to collect the knowledge of the participants' experiences and perceptions in relation to the research topic. They further indicated that the process and result of a phenomenon under study can be clarified through vigilant observation, reconstruction and analysis, which is either exploratory, descriptive or explanatory. For this research, a descriptive study process was used to study participants' responses via MS Teams and to collect data as narrated by the participant being interviewed.

A semi-structured interview schedule (Appendix D) comprising a list of questions was used to guide the interviews and determine the topics that were covered with the participant by the interviewer (Bearman, 2019). Interview questions were drafted in line with the research objectives of this study in order to elicit information from the participants that would address each of the objectives. Semi-structured interviews were conducted from the 26th of July 2024 to the 8th of August 2024 with 20 management

employees from Eskom Distribution Central East Cluster. One interview was reconducted on the 21st of September as the transcript could not be downloaded. The interviews were recorded on the MS Teams application as agreed upon by the participants and consent to participate in the interview and for the interview to be recorded was sought from all participants (see Appendix C). The length of interview times ranged between 12 to 45 minutes per participant. Other Eskom Divisions (Generation and Transmission) were excluded from the interviews. External stakeholders were also excluded in the determination of participants to be selected to be interviewed. Interviews were recorded and saved in the University of KwaZulu-Natal OneDrive data disposal, which is a cloud storage format, and access to the recordings is limited.

3.8 Data analysis

Bhat (2023) stated that in research, data analysis is a process of bringing data to a meaningful story and interpreting it to obtain understanding. He further stated that the data analysis process reduces a large portion of data into smaller portions that make sense. Thematic analysis was used to analyse the transcripts collected in this study. The thematic analysis method is used to evaluate content obtained from numerous sources for qualitative research: individual interviews and physical observations (Bhat, 2023). Bright and Du Preez (2023) stated that the stories and opinions told by people focus on discovering answers to the research questions. In thematic analysis, the researcher used the interpretive process by repeatedly reading and grouping the transcripts to formulate the themes and analyse patterns emanating from the data collected from the interview questions answered by the participants (Bright & Du Preez, 2023). Stuckey (2015) stated that the process of creating codes can be predetermined (also referred to as deductive or "a priori"), emergent, or a combination of both. Stuckey (2015) also stated that predetermined codes may be drawn from a previous coding dictionary of another researcher, or key concepts in a theoretical construct, or they may be derived from the interview list of research questions. A combination of predetermined and emergent codes was used for this research after thoroughly reading, grouping, and reducing participants' responses to the most relevant ones. Primary themes were derived from the research interview questions, and sub-themes were derived from the grouped participants' responses (emergent codes) and analysed to produce the findings of this research.

Mezmir (2020) argued that different researchers use different descriptions and numbers of steps or phases to do qualitative data analysis. He further suggested that different sources can be used to analyse qualitative data, and the most suitable one can be used from each source. Six phases of qualitative data analysis were used for this study, which are data familiarisation, generation of initial codes, theme search, theme review, theme definition and naming, and report production. The description and illustration of these steps, in line with Bree and Gallagher's (2016) thought, as followed by the researcher in this study, is outlined below:

3.8.1 Data familiarisation

This is the process where the researcher familiarised herself with the data collected during the interviews before filtering and sorting it, which involved listening to recordings from MS Teams, reading transcripts, studying, and partially correcting the transcripts so that they make sense.

3.8.2 Generation of initial codes

This is the process of generating interesting features, ideas, and patterns of the collected dataset from the interviews in a systematic method and organising data according to relevant code. Codes were identified through the reading of participants' responses and grouping of common statements from the interviews and numbering the statements to generate codes.

3.8.3 Theme search

At this stage, the researcher collected codes and generated the first level of themes by gathering all data related to each theme and removing irrelevant labels, thereby reducing the amount of data to work with. In the beginning, labels were generated from the manual coding of the participants' responses using an Excel spreadsheet (tables) and further reviewed into specific themes. The frequency of responses was counted using the Statistical Package for the Social Sciences (SPSS) software to generate themes. Elliott (2018) and Halevi Hochwald et al. (2023) stated that both SPSS and Nvivo software tools can be used to prepare text and identify the frequency of themes for qualitative research.

3.8.4 Theme review

This is a stage to further review the first group of themes and to generate common, streamlined themes from the second analysis. For this exercise, the first themes were further reviewed and reduced to the most relevant ones in line with the objectives and questions of this research.

3.8.5 Theme definition and naming

In this final theme review, further analysis was conducted to refine the details of the themes by generating definitions and names for each theme and grouping them into initial and sub-themes to align with the research objectives and questions.

3.8.6 Report production

This is the final opportunity for analysis, selection of vivid, compelling extract examples, final analysis of selected extracts, relating the analysis to the research question and literature, and producing a scholarly report of the analysis. This is the composition and synthesis of the study themes with the existing literature.

The themes that emerged in this study will be presented, discussed and supplemented with relevant current literature on the significance of the small-scale renewable energy market for Eskom in Chapter Five.

3.9 Practical characteristics of coding

The manual process of grouping and reducing qualitative data into more manageable groups of data is also called RADaR (Rigorous and Accelerated Data Reduction) technique, where collected data is entered into Excel tables that are reviewed several times to make the data more focused after each revision (Krishnan & Meena, 2024; Watkins, 2017). Stuckey (2015) and Bree and Gallagher (2016) suggested in their studies the use of an Excel spreadsheet as a manual process to perform data analysis for a research study. Krishnan and Meena (2024) and Watkins (2017) further supported the manual process of data analysis and stipulated those repetitions drawn from the interviews of the participants are defined as the focused second cycle coding based on the frequency of their appearance, as was done in this study.

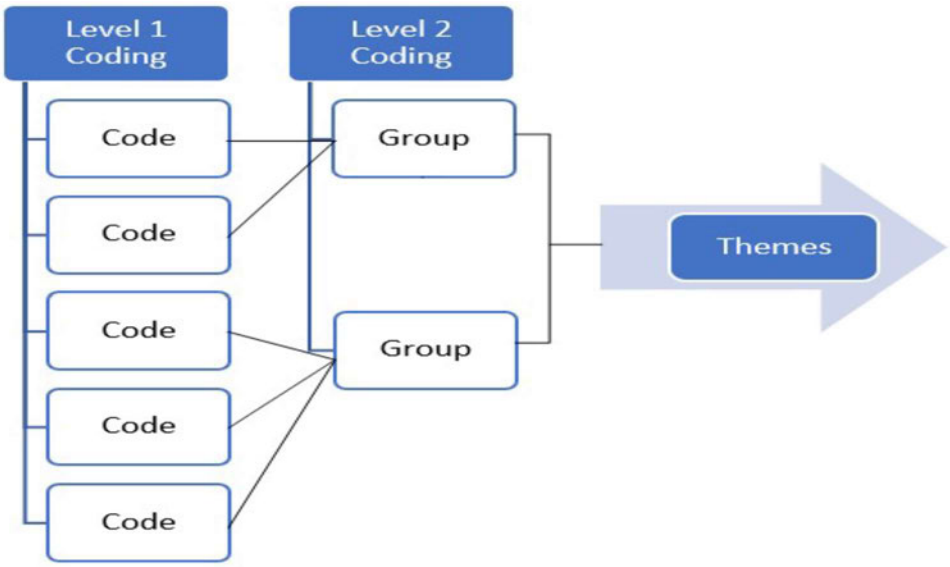


Figure 3. 1: Data and theme consolidation process

The above Figure 3.1 shows the coding process where related responses were coded and ultimately grouped into themes.

3.10 Ethical considerations

Before proceeding with any aspects of approaching participants or collecting data, ethical approval (Appendix A) was obtained from the Humanities and Social Science Research Ethics Committee of the University of KwaZulu-Natal. Once ethical clearance to proceed with the study had been granted, a

gatekeeper letter's (Appendix B) signed by the researcher's employer was obtained to allow the researcher to use Eskom Distribution as the research site for this study. To proceed with data collection, the identified participants from Eskom Distribution were requested to acknowledge their participation by signing a consent letter (Appendix C) granting permission for their intention to be interviewed by the researcher. The consent letter explained the nature and purpose of the study to participants and also informed them that they were free to withdraw from the research at any point. Interviews with the participants were recorded, as acknowledged and agreed to by the participants. The recordings and transcripts of the actual interviews will be kept securely as evidence of the engagements for data collection and analysis for a period of five years, whereafter they will be permanently deleted. Participants' identities were maintained anonymous throughout the interviews, and the participants were assured that their names would not be mentioned in the data analysis as indicated in the consent form. The researcher ensured participants' anonymity by using pseudonyms in the analysis of the themes and write-up of the findings of the study, and participants' personal information was not disclosed to any other person.

3.11 Trustworthiness of the research

Ahmed (2024) and Kyngäs, Kääriäinen and Elo (2020) stated that qualitative research commands impressions such as rigour (which is defined in the Oxford dictionary as the quality of being extremely thorough and careful), truthfulness, authenticity, and quality of the findings. Qualitative findings require the researcher to ensure firm trustworthiness to establish the credibility and reliability of the research, considering that this form of inquiry is subjective in nature (Ahmed, 2024). The four primary criteria for trustworthiness of qualitative research are credibility, transferability, dependability and confirmability (Ahmed, 2024; Kyngäs et al., 2020). Each of these aspects will be defined below and the steps taken by the researcher to ensure that these criteria were adhered to in the study will briefly be outlined.

3.11.1 Credibility

Nyirenda et al. (2020) and Ahmed (2024) stated that credibility involves two aspects: carrying out the study in a way that ensures that readers will believe the presented findings and taking steps to demonstrate credibility in research reports. Credibility is concerned with how congruent the findings are with reality. Approaches to enhance credibility include prolonged engagement, triangulation, saturation, rapport building, iterative questioning, member checking, using an inclusive coding approach where all themes are coded iteratively rather than reduced to fit predetermined criteria, and reflexivity (Nyirenda et al., 2020). For this research, 20 management employees of Eskom were interviewed (see Table 3.1 for demographic breakdown of participants). Interviews were conducted using the same questions (iterative) that were posed to the participants to collect data (Appendix D). Codes and themes were generated from the data collected during the semi-structured interviews with participants.

3.11.2 Transferability

Transferability describes the degree to which research findings will apply to other fields and contexts and is achieved through the thorough description of the study context and assumptions (Kyngäs et al., 2020; Nyirenda et al., 2020). By providing detailed and comprehensive explanations, researchers allow readers to evaluate how applicable the findings are to similar situations, thus improving the study's transferability (Ahmed 2024). The coding and theme generation undertaken in this research allow the readers to evaluate if the findings are applicable to situations of other market players in the small-scale renewable energy market, as the participants also relay their experience of the subject under study, where other companies are involved, other than Eskom Distribution.

3.11.3 Dependability

Dependability deals with the consistency of the research obtained through rigorous documentation of research approaches, data gathering techniques, and analysis procedures whereby another researcher or reader can follow the trail of decisions taken by the original researcher (Ahmed, 2024; Kyngäs et al., 2020). Kyngäs et al. (2020) stated that tables, attachments and figures can be included in the research, explaining the categorisation process in the final report. Ahmed (2024) stated that creating and preserving an audit trail, consisting of comprehensive logs to document the decisions made throughout the research, allows other researchers to replicate the study and, therefore, confirms the dependability of the findings. Kyngäs et al. (2020) further state that dependability can be evaluated through peer examination, independent coding and recoding, co-researcher dialogue, and panel discussions. The layout of this research was discussed in Chapter One and was followed through in the subsequent chapters and included in the write-up of the research. Tables, figures and other attachments were used to give a perspective of the research undertaken in relation to the topic of the study. Data collection and analysis were focused on the objectives of this research, thereby ensuring that consistency is maintained throughout the study.

3.11.4 Confirmability

According to Kasirye (2021), confirmability is concerned with the neutrality of the research, whereby the interpretation is not based on the preferences and viewpoints of the researcher but on the data collected and analysed. Confirmability is obtained by providing comprehensive information on decisions taken during the process of research, meetings held regarding the research, insightful thoughts, sampling, adopted research materials, findings emerging from research, and data management information. Nassaji (2020) stated that using purposeful sampling guarantees transferability through purposefully selecting various places and diverse participants, thereby naturally increasing the variability of specific knowledge that can be attained on the research topic. For this research, purposeful sampling was achieved through the selection

of managerial employees of Eskom Distribution from the Central East Cluster, which is a merger between FS and KZN provinces, who were interviewed to gather specific data related to the study. Details of the process of collecting and analysing data were detailed earlier in this chapter of this research. It is therefore confirmed that the study was not based merely on the researcher's viewpoint but on the data collected from a sample, as indicated in this chapter of the research, which is in line with the research objectives of this study.

3.12 Conclusion

The qualitative research undertaken in this study was based on the researcher's worldview, where the interpretive beliefs of the researcher were tested through a series of interviews with Eskom Distribution management employees. The process of data collection and analysis could only begin as soon as the ethical approval was granted. Twenty participants from Eskom Distribution Central East Cluster were purposively selected for inclusion in the study, and semi-structured interviews were conducted via MS Teams to obtain in-depth information regarding the research objectives and the topics addressed in the research questions. The data obtained from the interviews was analysed using an intense manual technique, also called RADaR, to define themes by following the six steps comprising the thematic method of data analysis. Participants' anonymity was assured through the consent form that each of them signed which stipulated that their personal information would be kept completely confidential at all stages of the research, including in the write-up of the findings in this report. The next chapter will present the findings of the study generated through the data analysis process.

CHAPTER 4: FINDINGS

4.1 Introduction

In the previous chapter, the focus was on discussing the research methodology employed in the study, which involved outlining the research approach, research design, sampling, data collection, and data analysis methods used. This chapter presents the findings that emanated from the thematic analysis of the data collected during the research and the interpretation of these findings. Data analysis was achieved through grouping of common interview statements to formulate themes that emanated from the data obtained during the semi-structured interviews with the 20 participants. The presentation of the data is structured in accordance with the research objectives of this study in order to address each of the objectives comprehensively. The analysis of the interview data resulted in ten primary study themes and 49 sub-themes as indicated in Table 4.1 on the following page. The primary themes were identified in line with the research questions, as suggested by Stuckey (2015). The sub-themes were identified from a thorough reading of the responses from the participants, grouping and counting the frequency of the common statements, and then eliminating or reducing them to only the most relevant ones (Bree & Gallagher, 2016; Watkins, 2017). The findings of the study are outlined in some detail in this chapter according to each of the ten primary themes, by presenting excerpts from the interviews that highlight the participants' views in relation to the identified themes.

Table 4. 1: Research themes and sub-themes

Research Objectives	Initial themes	Interview question	Frequency	Sub-themes
Objective 1: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution.	Small-scale renewable energy market description for Eskom Distribution	Describe the small-scale renewable energy market for Eskom Distribution	8	Nature and size of the SSEG customers
			7	Operational process of the programme
			5	Factors driving the programme
			2	Eskom's participation in the process
	Small-scale renewable energy market initiation for Eskom Distribution	When was the small-scale renewable energy market initiated?	6	Programme timing and trends
			3	Process of enrolling customers in the programme
			3	Government involvement in the process
			5	Other matters relating to the programme inception
	Process description and stakeholders involved	Describe the process involved?	6	General process description
		Who are the stakeholders involved and what is their role?	13	Stakeholders and their roles
	Eskom's reasons to venture into the small-scale renewable energy market	Why would Eskom Distribution want to venture into the small-scale renewable energy market?	11	Statutory reasons for Eskom to venture into the small-scale renewable energy market.

			13	Performance and efficiency reasons for Eskom to venture into the small-scale renewable energy market
			6	Adaptation to change
			4	Pricing and revenue
Objective 2: To identify the benefits of the small-scale renewable energy market for Eskom Distribution.	Eskom's benefits	What are the benefits for Eskom Distribution of taking part in the small-scale renewable energy market?	13	Energy security
			9	Customer retention and market share growth
			12	Revenue and balance sheet elements
			4	Organisational and operational matters
			11	Global trends
			3	Grid management and reach
	Stakeholders' gain in the small-scale renewable energy market	How do the various stakeholders gain in the small-scale renewable energy market?	6	Benefits for Eskom in the small-scale renewable energy market
			13	Benefits for the small-scale renewable energy customer
			9	Benefits for the Government
			11	Benefits for the industrial, financial, and other sectors in the small-scale renewable energy market

Objective 3: To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution.	Bottlenecks for Eskom Distribution	Where are the bottlenecks for Eskom Distribution in venturing into the market?	8	Network Grid bottleneck
			4	Legal requirements bottlenecks
			4	Cost to customer bottlenecks
			3	Eskom Structure and Management bottlenecks
			4	Equipment and supply bottlenecks
			7	Shortage of skilled manpower
			3	Marketing and customer handling
	Possible roll-out improvements	What can be done to improve the rollout of the initiative?	2	Customer participation
			3	Customer cost reduction strategies
			3	Network upgrade and expansion
			9	Legal and procedural matters
			2	Strategic partnerships with industry and other stakeholders
			1	Policy level strategies
	Recommendations for accessibility to Eskom Distribution	What recommendations do you have to make for the small-scale renewable energy market to be more accessible to Eskom Distribution?	5	Initiation costs, funding, and energy price

			8	Marketing matters
			5	Registration matters involving NERSA
			4	Technical matters, research, and development
			1	Matters related to government policies
			1	Eskom organisational structure
	Other matters of the small-scale renewable energy market in Eskom Distribution	Do you have anything else to add regarding Eskom Distribution's initiative to participate in the small-scale renewable energy market?	1	Efficiency
			3	Drive towards manufacturing renewable energy equipment
			2	Cost and revenue

4.2 Objective 1: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution

In the first part of the interviews, the participants were asked about the importance of participating in the small-scale renewable energy market by Eskom Distribution. The research objective was: *to identify the importance of participating in the small-scale renewable energy market for Eskom Distribution*, which resulted in the emergence of four primary themes (as illustrated in Table 4.1 above) that align with the research questions posed to the participants. The detailed analysis of the participants' responses in terms of the four primary themes and the sub-themes related to each is discussed in the sections below.

4.2.1 Theme: Small-scale renewable energy market description for Eskom Distribution

This section examines the first theme which is the *small-scale renewable energy market description for Eskom Distribution*. It is related to the first objective in line with the first question posed in the interviews which reads as follows: *Describe the small-scale renewable energy market for Eskom Distribution.*

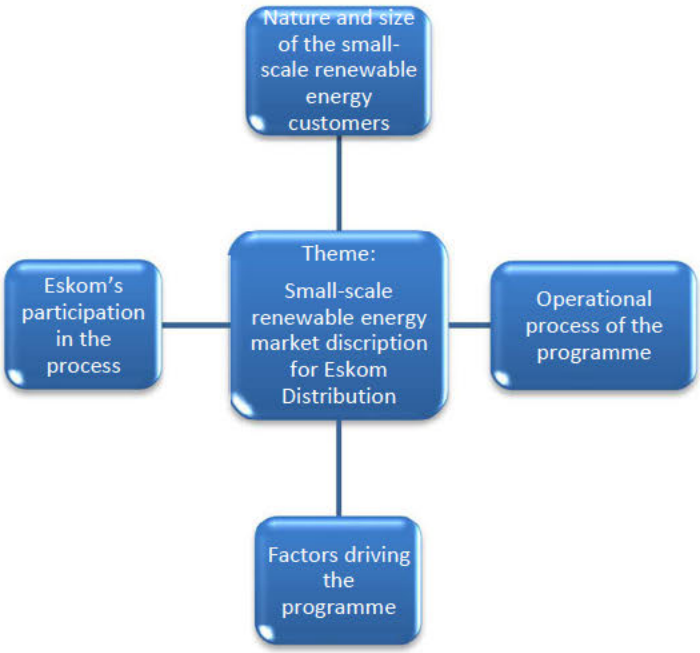


Figure 4. 1: Theme: Small-scale renewable energy market description for Eskom Distribution

Figure 4.1 above shows the initial theme and four sub-themes of this objective that give insight to the responses from the participants, which will be discussed in the sections that follow. The sub-themes identified were: nature and size of renewable customer; operational process of the programme; factors driving the programme; and Eskom participation in the process. They represent the participants' understanding and their responses related to their lived experiences, which aligns with the phenomenological strategy where the researcher recognised the core of the participants' experiences about the study. The following sub-themes support the researcher's worldview for this research, which is interpretivist or constructivist, used to draw the analysis based on the participants' responses.

4.2.1.1 Nature and size of the small-scale renewable energy customers

The responses gathered from the participants related to this theme spoke to the nature and size of the customers participating in the Eskom SSEG programme. One of the participants indicated that this programme is primarily driven by renewable energy producers, though it is not solely renewable energies that are in this market. Participant 11 said:

"It means that's installation is primarily owned by the customers, which includes both non-renewable and renewable energy sources, which are less than one MVA. But in Eskom, we primarily focus on the renewable aspects." (Participant 11)

Seven more participants echoed Participant 11's view as they indicated that small-scale renewable and non-renewable energy is owned by private customers, but Eskom focuses on renewable sources customers, and these pollute less and reduce the carbon footprint.

In determining the size of the customer, some participants mentioned the categories of the small-scale renewable energy supply as:

"It's, I would say that it's got two parts, the one is the LV side. The LV application is normally for zero to 350 kilowatts. That is the LV side, and then the other type is for MV, which is between 350 kilowatts and 1000 kilowatts. So, on the LV, the customer is using our transformer, and the MV is a bulk connection that we give to the customer." (Participant 1)

To determine the nature of the SSEG, eight participants indicated that small-scale renewable energy encompasses the generation of electricity from renewable sources or small, decentralised sources. It mainly excludes the use of fossil fuels and includes technologies such as PVs, wind turbines, micro-hydro, and biomass. They also mentioned that these systems are typically installed by small independent producers at schools, clinics, commercial, industrial, agricultural, and residential sites. Participant 15 said:

"In my understanding, I would say it refers to our generation facilities that are located closer to customer sites, in fact in customer sites, where the electricity is consumed, you may find some in industrial, some in commercial, some in residential and there's PV that is mainly used and there are other technologies that are involved." (Participant 15)

Two participants (Participants 2 and 9 of FS) mentioned that it is mainly farmers who are installing PVs. Participant 7 further mentioned that Eskom also has an opportunity to install small-scale renewable energy generators at the customer network centres (CNCs) and Eskom-owned offices that will assist in using renewable energy:

"If we can target businesses that can maybe assist there in using the renewable and it will relieve the power stations and during the peak periods and also like even internally if we can have a small-scale renewable at the CNC's and Eskom owned offices that will also assist us in reducing the demand from the municipality side as well during the day and also limit the interruption of supply whether if it's like during planned maintenance or breakdowns or even during load shedding." (Participant 7)

Considering the changing nature of the customer in the market, there is a need to ensure that energy is measured from both the prosumer and Eskom. Participant 20 emphasised ensuring that appropriate meters

and tariffs are in place, including bidirectional meters, so that Eskom can measure both the consumption and the export of energy. The participant added:

"It was only this year that it was opened to residential use because we have now made the smart meters available, and to connect to the Eskom grid, you need to have a bidirectional meter. So, we ask that the customers change their tariff to a time-of-use tariff, and we put in the appropriate metering for bidirectional, so that Eskom can measure both the consumption and the export of energy. So, it's only when we introduced the smart meters that we were able to measure what the customers can export now for all sectors. When customers export power to the grid, we've given them the option to offset this energy on their bill. So, now this has created a market in South Africa." (Participant 20)

In general, participants in the Eskom SSEG programme are small-scale decentralised customers, like schools, clinics, farms, industries, and AGRI-processors who do not use fossil fuels but use renewable resources like wind, micro-hydro, PVs, and biomass. Eight out of the 20 participants mentioned this in their statements. Another eight participants identified small-scale customers with renewable energy installations as participants in the Eskom SSEG programme.

4.2.1.2 Operational process of the SSEG programme

This is the second sub-theme related to the first initial theme, as listed in Table 4.1. The following discussion outlines statements from the participants on how Eskom engages with SSEGs on operational matters, which are themed responses as they answered the interview question related to the sub-theme of the first objective of the research.

In the responses collected from interviews, three participants indicated that customers apply to Eskom through the SSEG embedded generators process for Eskom to facilitate participation in the programme. Participant 14 stated the following:

"For me, the only way I would say we are starting to penetrate when it comes to small-scale renewable energies is for those people who want to do this PV solar system with Eskom, and they're applying to us through the small-scale embedded generators process. But as to complying fully in the market whereby Eskom is offering to customers these alternatives, I don't think we are there yet, but all that I can say we are facilitating those customers of ours who want to have a SSEG and still be connected on our network, so we are facilitating that process in order for them to be able to do so." (Participant 14)

The participants further indicated that customers generate energy for self-use, with some not even connected to the Eskom grid. Some are hybrid (supply when having excess, then use Eskom energy when in need).

Customers can then develop a new income stream in addition to their mainstream business. Participant 11 explained the connection categories of the SSEGs:

"The system that we know of is the hybrid system, which follows the same application process as a grid-tied system. In the hybrid system approach, the customer would be using the Eskom supply as a means of alternative to charge. For example, their battery or if their backup system is not able to provide them with the energy supply that they require." (Participant 11)

Participant 4 confirmed the usage of the system by the SSEGs:

"These are typically installed at residential, some commercial, and industrial sites. Users either consume the energy themselves, or they can have the option of feeding it back to the grid." (Participant 4)

To define the limits of operations of the SSEGs, Eskom manages customers of up to one MVA, and any installation above that limit is regulated by NERSA. Participant 3 confirmed this in the following response:

"Some updates stated that it can start up from 3 kilowatt up to one MVA, and that process is very much basically driven or managed within the Eskom space, whereas when you go above 1 MVA, then it becomes NERSA regulated." (Participant 3)

Participants indicated that customers can 'bank' extra energy by exporting to the Eskom network and use it later in the same tariff period. Customers can offset their bills with the energy they generate into the Eskom system to save costs. Participant 1 had the following to say in this regard:

"On the LV, the customer is using our transformer and the MV is a bulk connection that that we give to the customer, and then it is used as a banking system where the customer doesn't get paid for whatever energy they exported to our network, but they can bank it and can use it in the same tariff period." (Participant 1)

From the analysis of the participants' views of the operational process of the SSEGs, it was evident that when Eskom participates in the small-scale renewable energy market through managing the customer application process, the SSEGs as Eskom customers can generate profit while they operate their renewable energy systems. This is a means to encourage customers to participate in the programme.

4.2.1.3 Factors driving the programme

This section outlines the interview responses of the participants and their views on the third sub-theme that emerged related to the first primary theme addressing objective one, namely the factors that are driving the SSEG programme. Participant 6 stated the following:

"Lately, the small-scale renewable energy market is rapidly starting to evolve. In my opinion, this was caused by challenges experienced primarily by Eskom in terms of us having supply constraints, and there is not enough energy to supply all our customers." (Participant 6)

Some participants mentioned that the increase in the cost of electricity, coupled with the decrease in the cost of PV installations, has seen this sector grow. Inclusion of government policy on PVs (deregulation of the Eskom monopoly) has encouraged more participation from the energy generators. Participants also indicated that there is a need for Eskom to embrace these new changes that also expand its power generation capacity. Participant 10 said:

"The small-scale renewable energy market in distribution can be categorised as prosumers, which simply means that we now have a deregulated energy system where previously, Eskom was the sole generator. transmitter and distributor of power." (Participant 10)

On Eskom embracing the new changes, Participant 19 stated the following:

"What's important in the distribution context is that we now no longer have only access to generation from what would be the Eskom generation power station. In terms of the market for distribution, we now have potential access to diversified generation that we didn't have access to before, and it also gives our customers opportunities to participate in generation. Now we're creating a new type of relationship with our customers in the renewable energy space. So, this market kind of gives us new avenues that were never open for the distribution business before, with benefits on both sides to distribution, reducing the cost of generation, helping us achieve certain goals like carbon neutrality." (Participant 19)

4.2.1.4 Eskom's participation in the process

This section outlines the responses of the participants related to sub-theme four of initial theme one addressing the first objective, namely how Eskom is involved with the customers in the SSEG programme.

There are various views that were collected from the participants during the interviews regarding Eskom's participation in the SSEG process. Some views and attributes from the participants were that Eskom is not doing enough in the SSEG sector, and the private sector is taking over. Some participants indicated that for Eskom Distribution, entering this market involves integrating the micro-scale systems into the existing infrastructure and managing the stability of the bi-directional energy flow.

The following view was mentioned by Participant 17 regarding Eskom's participation:

"So, where Eskom gets involved with regard to the small-scale renewable energy is when we encourage customers to legalize their installation. Legalising this installation will also assist Eskom in having a view

of where the energy that is being pushed to the grid is coming from. So, the number one objective of Eskom in encouraging or marketing the authorisation or legalisation of SSEGs is the safety of our technicians who work on the networks." (Participant 17)

The findings of the data analysis of responses related to this sub-theme show that Eskom participation is long-awaited. The findings also confirmed that Eskom's participation assists in legalising the installations and possibly making the process simpler for the customer and safer for the technicians who work in the network.

In the first initial theme, four sub-themes were generated in response to the research question. These sub-themes provided phenomena from the participants' responses from the question posed in the interviews that the researcher could interpret. The response to the question related to this theme is that the small-scale renewable energy market is described by the nature and size of the customers, impacted by the operational processes of the programme, driven by salient factors affecting Eskom and the customers such as load-shedding, and greatly influenced by Eskom's participation in the programme. The following section examines the second initial theme that was identified in relation to objective one that guided the study, and explores the four sub-themes that emerged from participants' responses.

4.3 Objective 1: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution

In this section, the participants were asked about the importance of participating in the small-scale renewable energy market by Eskom Distribution. The research objective was *to identify the importance of participating in the small-scale renewable energy market for Eskom Distribution*, which resulted in four themes (as illustrated in Table 4.1) that align with the research questions posed to the participants. Table 4.3 below shows the process of identifying themes and secondary themes for this objective (Watkins, 2017; Bree & Gallagher, 2016). The detailed analysis is discussed in the chapter analysis.

4.3.1 Theme: Small-scale renewable energy market description for Eskom Distribution

This section looks at the first theme which is the *small-scale renewable energy market description for Eskom Distribution*. It is related to the first objective in line with the first research question which reads as follows: *Describe the small-scale renewable energy market for Eskom Distribution.*

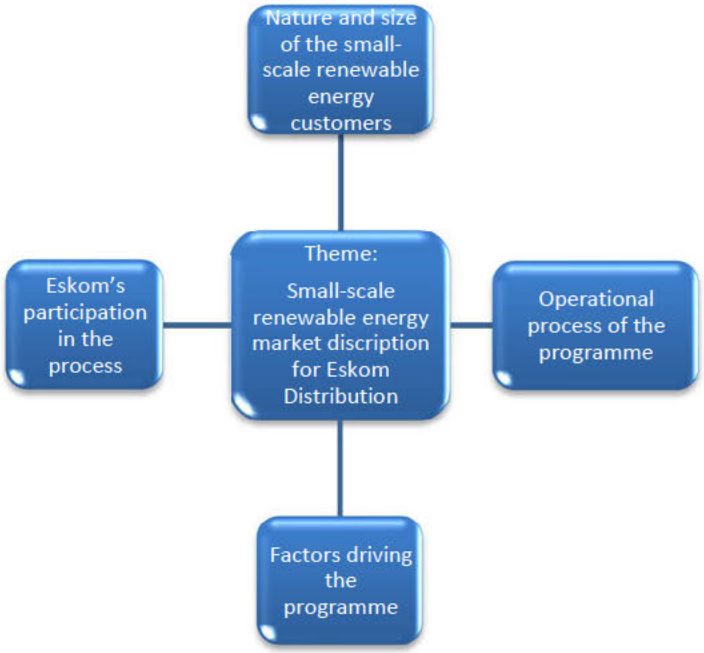


Figure 4. 2: Theme: Small-scale renewable energy market description for Eskom Distribution

Figure 4.1 shows the initial theme and secondary themes of this objective that give insight to the responses from the participants and will be discussed in the sections that follow. The secondary themes identified were nature and size of renewable customer, operational process of the programme, factors driving the programme and Eskom participation in the process. They represent the understanding of the questions by the participants and their responses is related to their lived experiences which aligns with the phenomenological strategy where the author recognised the core of the participants experiences about the study. The following secondary themes support the researcher's worldview for this research, which is interpretivist or constructivist, used to draw the analysis based on the participants' responses.

4.3.1.1 Nature and size of the small-scale renewable energy customers

The responses gathered from the participants on this theme spoke to the nature and size of the customers participating in the Eskom SSEG program. One of the participants indicated that this programme is primarily driven by renewable energy producers, though it is not solely renewable energies that are in this market. Participant 11 stated the following:

"It means that's installation that is primarily owned by the customers, which includes both non-renewable and renewable energy sources, which are less than one MVA. But in Eskom, we primarily focus on the renewable aspects." (Participant 11)

Seven more participants echoed the above view of the participant as they indicated that small-scale renewable and non-renewable energy is owned by private customers, but Eskom focuses on renewable sources customers and these pollute less and reduce the carbon footprint.

In determining the size of the customer, participants 1 and 2 mentioned the categories of the small-scale renewable energy supply as:

"I would say that it's got two parts, the one is the LV side. The LV application is normally for zero to 350 kilowatts. The other type is for MV, which is between 350 kilowatts and 1000 kilowatts. So, on the LV, the customer is using our transformer, and the MV is a bulk connection that we give to the customer." (Participant 1)

"Currently there are three types of small-scale renewable energies: the one is on the LV from zero to 350 and LV's up to, according to IEEE, up to 3000 Volts. And then on the MV side, that is up to 30,000 Volt. That is, they need 350 to 1000 kilowatts, or one MVA. Then on the LV side, the customer is using the Eskom transformer and then on the MV side we just put in the CTVT unit and then it's connected at the recloser. Then now both of this is embedded behind the meter." (Participant 2)

Participant 10 further provided other categories as he narrated:

"I would categorise it to say that the small-scale embedded market is anything that is under one MW that is SSEG. But in there, there's also three other categories. You get category A1 and A2. It talks about smaller type of customer bases, so it's either up to 60 amps or then you can go up to 100 kilowatts as well. But anything under one MW, we classify it as small scale, particularly just to cover people who want security of supply." (Participant 10)

To determine the nature of the SSEG, eight participants indicated that small-scale renewable energy encompasses the generation of electricity from renewable sources or small, decentralised sources. It mainly excludes the use of fossil fuels and includes technologies such as PVs, wind turbines, micro-hydro, and biomass. They also mentioned that it is typically installed by small independent producers at schools, clinics, commercial, industrial, agricultural, and residential sites. To mention a few, statements from participants 13 and 15 are as follows:

"Firstly, the small scale and its generation refers specifically to the power generation facility which is located in the residential and commercial as well as industrial sites."(Participant 13)

"In my understanding, I would say it refers to our generation facilities that are located closer to customer sites, in fact in customer sites, where the electricity is consumed, you may find some in industrial, some in commercial, some in residential and there's PV that is mainly used and there are other technologies that are involved." (Participant 15)

"Small-scale renewable energy encompasses the generation of electricity from renewable sources or small, decentralised sources, so it wouldn't be like the use of fossil fuels or the power station, so it would include technologies such as PVs." (Participant 4)

Two participants mentioned that it is mainly the farmers who are installing PVs; that is, participants 2 and 9 of FS. Participant 7 further mentioned that Eskom also has an opportunity to install small-scale renewable energy generators at the customer network centres (CNCs) and Eskom-owned offices that will assist in using renewable energy:

"If we can target businesses that can maybe assist in using the renewable and it will relieve the power stations and during the peak periods and also even internall,y if we can have a small scale renewable at the CNC's and Eskom owned offices that will also assist us in reducing the demand from the municipality side as well during the day and also limit the interruption of supply whether if it's during planned maintenance or breakdowns or even during load shedding." (Participant 7)

Considering the changing nature of the customer in the market, there is a need to ensure that energy is measured from both the prosumer and Eskom. A participant emphasised ensuring that appropriate meters and tariffs are in place, including bidirectional meters, so that Eskom can measure both the consumption and the export of energy. Participant 20 added:

"It was only this year that it was opened to residential use because Eskom now made the smart meters available, because to connect to the Eskom grid, you need to have a bidirectional meter. So, Eskom asks that the customers change their tariff to a time of use tariff, and then put in the appropriate metering for bidirectional, so that Eskom can measure both the consumption, including the export of energy. So, it's only when we introduced the smart meters where we were able to measure what the customers can export now for all sectors, when customers export power to the grid, we've given them the option to offset this energy onto their bill. So, now this has created a market in South Africa." (Participant 20)

In general, participants in the Eskom SSEG program are small scale decentralised customers, like schools, clinics, farms, industries, and AGRI-processors who do not use fossil fuels but use renewable resources like wind, micro-hydro, PVs, and biomass. Eight out of twenty of the participants mentioned this in their

statements. Another eight participants identified small scale customers with renewable energy installations as the participants in the Eskom SSEG program.

4.3.1.2 Operational process of the SSEG programme

This is the second secondary theme of the first initial theme as listed in table 4.1 and figure 4.1 where the participants views are outlined on how Eskom engages with SSEGs on operational matters. The following statements are themed responses from the participants as they answered the interview question related to the secondary theme of the first objective of the research:

In the responses collected from interviews, three participants indicated that customers apply to Eskom through the SSEG embedded generators process for Eskom to facilitate participation in the program. Participant 14 stated the following:

"As to complying fully in the market whereby Eskom is offering to customers these alternatives, I don't think we are there yet, but Eskom is facilitating those customers who want to have a SSEG and still be connected on the Eskom network, for them to be able to do so." (Participant 14)

The participants further indicated that customers generate energy for self-use with some not even connected to the Eskom grid. Some are hybrid (supply when having excess, then use Eskom energy when in need). Customers develop a new income stream in addition to their mainstream business. Participant 11 explains the connection categories of the SSEGs:

"The system that we know of is the hybrid system, which follows the same application process as a grid-tied system. In the hybrid system approach, the customer would be using the Eskom supply as a means of alternative to charge. For example, their battery or if their backup system is not able to provide them with the energy supply that they require." (Participant 11)

Participant 4 confirmed the usage of the system by the SSEGs:

"These are typically installed at residential, some commercial, as well as industrial sites. Users either consume the energy themselves, or they can have the option of feeding it back to the grid." (Participant 4)

To define the limits of operations of the SSEGs, Eskom manages customers of up to one MVA, and any installation above that limit is regulated by NERSA. Participant 3 confirmed this in the following response:

"It can start up from 3 kilowatt up to one MVA, and that process is driven or managed within the Eskom space, whereas when you go above 1 MVA, then it becomes NERSA regulated." (Participant 3)

Participants indicated that customers can "bank" extra energy by exporting to Eskom network and use it later in the same tariff period. Customers can offset their bills with the energy they generate into the Eskom system to save costs. The narration of participant 20 of their response is as follows:

"When customers export power to the grid, we've given them the option to offset this energy onto their bill, and now that Eskom has made it an option to offset kWh on the bill to save cost, whatever the consumption is and whatever they could use inside was on the PV system, but now if they have excess power during the day when homeowners are not there, or when over the weekends when the businesses don't use the power, then they can export the power and get credit in the bill." (Participant 20)

From the analysis of operational process of the SSEGs it was evident that when Eskom participates in the small-scale renewable energy market through managing the customer application process, the SSEGs as Eskom customers can generate profit while they operate their renewable energy systems. This is a means to encourage customers to participate in the programme.

4.3.1.3 Factors driving the programme

This section outlines the interview responses of the participants as they gave factors that are driving the programme. Participants 6, 13 and 20 stated the following:

"The small-scale renewable energy market is rapidly starting to evolve. This was caused by challenges experienced primarily by Eskom in terms of having supply constraints, and there is not enough energy to supply all our customers." (Participant 6)

"Customers are looking for a reliable supply." (Participant 13)

"This market was created as a result of the supply constraint in Eskom, because Eskom had load shedding, it created this market." (Participant 20)

Some participants mentioned that the increase in cost of electricity coupled with the decrease in the cost of PV installations has seen this sector grow. Inclusion of government policy on PVs (deregulation of the Eskom monopoly) has encouraged more participation from the Energy Generators. Participants also

indicated that there is a need for Eskom to embrace these new changes that also expand its power generation capacity. The following statements were responses from participants 6 and 10 relating to the interview question:

"There's been an increase in the cost of electricity and a decrease in the cost of PV installations. There's also been a change in terms of the government's policies that have not adopted this kind of technology." (Participant 6)

"The small-scale renewable energy market in distribution, particularly, can be categorised as prosumers, and that simply means that we now have a deregulated energy system where previously, Eskom was the sole generator. transmitter and distributor of power." (Participant 10)

On Eskom embracing the new changes, one participant stated the following:

"What's important in the distribution context is that we now no longer have only access to generation from what would be the Eskom generation power station. In terms of the market for distribution, we now have potential access to diversified generation that Distribution didn't have access to before, and it also gives the customers opportunities to participate in generation. Eskom is now creating a new type of relationship with customers in the renewable energy space. So, this market kind of gives Eskom new avenues that were never open for the distribution business before, with benefits on both sides to distribution, reducing the cost of generation, helping Eskom achieve certain goals like carbon neutrality"(Participant 19)

4.3.1.4 Eskom's participation in the process

This section of secondary themes outlines the responses of the participants on how Eskom is involved with the customers in the programme.

There are various views that were collected from the participants during the interviews in relation to Eskom's participation in the SSEG process. Some views and attributes from the participants were that Eskom is not doing enough in the SSEG sector, and the private sector is taking over. Some indicated that for Eskom Distribution, entering this market involves integrating this micro-scale systems into the existing infrastructure and managing stability of this bi-directional energy flow.

The following reviews were mentioned by the participants 14 and 17 regarding Eskom's participation:

"In terms of the markets, Eskom still has a long way to go, and another aspect that Eskom is involved in is the microgrids, which are still very new for Eskom as well." (Participant 14)

"Where Eskom gets involved with regards to the small-scale renewable energy is when encouraging customers to legalise their installation. It's also to ensure that these are registered with NERSA, and legalising the installation will also assist Eskom in having a view of where the energy that is being pushed to the grid is coming from. So, the number one objective of why Eskom is encouraging or marketing the authorisation or legalisation of SSEGs, or small-scale renewable energy, is for the safety of the technicians who work on the networks". (Participant 17)

The results from the data analysis of this secondary theme show that Eskom participation is long-awaited. It also confirmed that Eskom's participation assists in legalising the installations and possibly making the process simpler for the customer and safer for the technicians who work in the network.

In this theme, four secondary themes were generated in response to the research question. These secondary themes provided phenomena from the participants that the researcher could interpret to respond to the research question. The response to the question related to this theme is that the small-scale renewable energy market is described by the nature and size of the customers, impacted by the operational processes of the programme, driven by salient factors affecting Eskom and the customers such as load-shedding, and greatly influenced by Eskom's participation in the programme. The following themes and secondary themes follow the same narrative of the analysis as discussed below.

4.3.2 Theme: Small-scale renewable energy market initiation for Eskom Distribution

In this theme, the participants responded to an interview question that asked: *When was the small-scale renewable energy market initiated?* From this question, the *small-scale renewable energy market initiation for Eskom Distribution* theme was formulated. Figure 4.2 below shows the initial theme and sub-themes generated from the participants' responses.

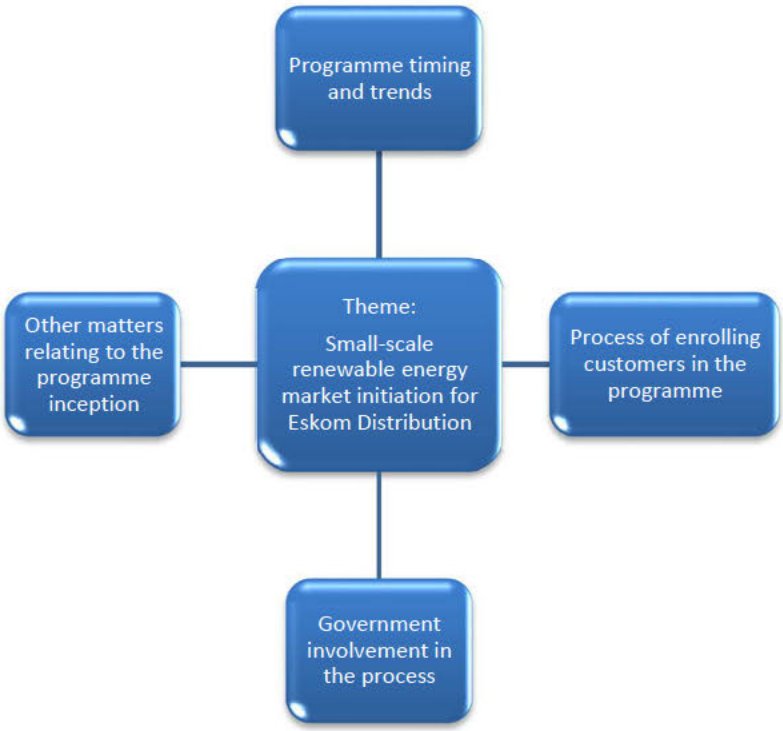


Figure 4. 3: Theme: Small-scale renewable energy market initiation for Eskom Distribution

The following sections will provide the responses from the participants related to the four sub-themes that emerged in relation to the second initial theme identified in addressing objective one guiding the research.

4.3.2.1 Approximate timing of the programme and trends

This section outlines the participants' responses that point to their views of the perceived years of inception of the small-scale renewable energy programme. There were disparate views from the participants regarding when the small-scale renewable energy market was initiated, ranging from participants noting that the market was initiated in the 70's right up to 2023. Participant 20 expressed their knowledge on the timing of the programme as follows:

"SSEG is brand new to Eskom. It is a brand-new product. We have never in the history of Eskom allowed a generator to be connected." (Participant 20)

Some participants mentioned that SSEG is brand new to Eskom, hence there was a need to learn all the technical and legal issues about the PV market. They further indicated that load shedding was a factor in implementing the technology between 2020 and 2021. A few participants in FS confirmed this in their responses as they specified the year 2020, when the programme took off and was then regulated in 2021. Participant 10 stated:

"With the small-scale embedded generation, I think the earliest documents that I can recall of NRS097 were around 2020 or 2021." (Participant 10)

On the other hand, a few participants from KZN specified the very first inception of the small-scale renewable energy technology in the market as being in the 1970's and 1980's, and Participant 11 said:

"The renewable energy markets date back to the 1970s, but it was not to be commercialised globally until the 1980s in South Africa, and we only came into the market in 2021 when NERSA got involved with the DMRE to approve IPPs to come on board or come into the market." (Participant 11)

The implementation of the SSEG programme required some processes and documentation to be in place. The participants alluded to the fact that official documentation was started when deregulating IPP around 2014, and the first ones came online around 2016, but there was no legislation at that time for SSEG customers that needed a license at that stage. They further indicated that a few policies were developed by NERSA that outlined the role of renewable energy and its formalisation. The participants also confirmed that the Energy Services Department manager in Eskom is involved in making follow-ups with unregistered customers, and once they are identified, the registration process is followed through.

The following was the response from Participants 17 and 19 in relation to the process and documents:

"It's a different process for SPU's and for LPU, but all in all, customer needs to convert into a time of use tariff; for SPU customers, they need to convert into homeflex, for LPU customers, they need to convert to ruralflex, miniflex, or megaflex, then we complete an application form. Once the conversion has been done, we quote the customer on the correct tariff." (Participant 17)

"There are NRS documents that formalise the engineering processes. So, a lot of engineering development had to happen because it didn't exist in terms of our standards, in terms of our procedures, how planners work, how designers work, all of those kinds of things." (Participant 19)

Regarding the process of applications, the participants indicated that most of the original customers applied during 2017/2018 and were moved to the Low Voltage (LV) connection method in 2022 when the LV (small-scale) embedded generation was approved. Participant 14 said:

"Around 2017/2018. I think that's when we started hearing about small-scale embedded generators (SSEGs), and the role of Eskom was to put processes in place on whether the customers are going to be allowed to have these SSEGs connected to our networks." (Participant 14)

Some participants pointed out that SSEG started with the IRP of 2018/2019, but that the concept of renewable energy started as far back as 2011, and by 2019, there were a few generators that were connected to the Eskom grid. Some participants indicated that the programme started in 2010 due to load shedding as a factor in South Africa for SSEG, and peaked in the year 2020 when load shedding intensified.

Participant 18 indicated that there was a big drive with high targets started in 2023, but that implementation has not been easy; hence, there was a need to introduce incentives:

"We started to drive it quite hard with the high targets last year, and then we realised that we were struggling with it, and therefore some initiatives, some incentives needed to be added to it." (Participant 18)

The above presentation of the findings highlighted discrepancies in participants' views of how long the SSEG technology has been in place and how South Africa and Eskom have taken off to implement it. It gave an insight that SSEG has long been in existence, though the country has only progressed slowly in implementing it.

4.3.2.2 The process of enrolling customers in the SSEG programme

The process and steps followed in enrolling customers into the SSEG programme were provided by the participants in their responses to the second interview question which gave rise to this sub-theme. The process of registering the customers seemed cumbersome and, in some cases, tedious for the customer to attempt by themselves. The following extract was collected from Participant 14:

"I think many customers were aware of the process, or maybe the process was too complex for them. In the sense that most of them chose not to contact Eskom when they were putting up their rooftop. Only now, Eskom is doing a retrofitting exercise to say, now that you have it, let's make it legal, and make sure that Eskom knows about it, and it is legalised." (Participant 14)

While continuously striving to attract more customers to legalise their installations, those who want to follow the registration process access Eskom in different ways, as explained by Participant 17:

"For the customers that approach us, they approach us via either phone, the call centre, and they speak to the customer execs, or some of them go directly to the head office and then we get the information from the head office and then the energy advisors will then contact the customer and follow the same process as what we would follow with regard to the unauthorised SSEGs." (Participant 17)

Once customers have approached Eskom, they are directed to choose from two categories depending on the size of their installation, as described by Participant 1 below:

"The MV applications follow the major route, and the LV applications follow the minor route." (Participant 1)

Not all policies, standards and procedures were known to the customers, and some were not initially in place, as some participants indicated, but with time, Eskom has put these in place. The participants also indicated that bringing external generators into existing networks affects existing businesses, so there would also have been aspects of improving existing infrastructure so that it could meet the needs of connecting EGs. A response from Participant 19 is as follows:

"Bringing EGs into existing networks also affects existing business, so they would also have been aspects of developing or trying to close the gap of our existing infrastructure, so that it could meet the needs of connecting EGs." (Participant 19)

The analysis of these responses indicated that the process of registration has not been simple for the customer, but with Eskom taking part in the market, the process can be simplified, and there are more opportunities for legalising more customers if the process is simplified.

4.3.2.3 Government involvement in the process

This section outlines the participants' responses on government involvement and legal matters related to the process of registering SSEG systems. According to the participants, government policy through the relevant department (i.e., NERSA) drives the regulatory process of the sector and encourages growth in the renewable energy market. Participant 8 explained the process as follows:

"The process supports registering with NERSA, the regulator, to check, depending on the size of your generator, PV, or whatever you're using, to be connected to our grid. So, you need to have the paperwork, you need to have the CCA, you need to state that it is in a good state and legal for it to be used and to connect to the grid." (Participant 8)

Some insights from the participants revealed that small-scale embedded generators do not require licenses but do need to be registered with Eskom, where a registration and compliance certificate is issued, and NERSA must also be notified. Participant 10 explained this as follows:

"We look through the process, we then give you a letter, we send the letter to NERSA if needed. Again, it's just regulatory compliance when you install an SSEG." (Participant 10)

This section explained the involvement of government in the process of enrolling and registering customers in the SSEG programme. The next section will discuss other matters relating to the SSEG programme.

4.3.2.4 Other matters relating to the inception of the programme

The renewable energy sector involves different technologies that need to be adopted, thus the need for stakeholder engagement and collaboration in policy formulation. Stakeholders include government agencies, private sector companies, and consumers. Participant 4 mentioned the following:

"There is use of different technologies, so they need to be adopted, and then there needs to be stakeholder engagement, collaboration amongst stakeholders, including government agencies, private sector companies, and consumers." (Participant 4)

There is still a need for infrastructure development, especially for Eskom Distribution, to accommodate the new technologies into the existing infrastructure. Participant 4 stated the following:

"It needs to have a lot of actors for it to be successful, as well as infrastructure development, especially for distribution. You need to make sure, because you will be accommodating these new technologies into an existing infrastructure." (Participant 4)

In the interviews held with participants, one participant alluded that there is an uptake by financial institutions to provide rebates and finance options. Banks now provide financial options to fund the installation of small-scale renewable energy generation. Participant 17 went on to say:

"It was also an uptake by financial institutions to provide rebates and finance options. If you look at Standard Bank and even all the banks now, they provide you with a financial option or a financial loan to install this PV, and I think now it is the process involved in terms of how it has started to provide uptake of small-scale generation in South Africa." (Participant 17)

A participant indicated that customers in remote areas can have stand-alone micro-grids as their source of electricity supply. In KZN, there are 2 micro-grids with more proposed in areas where the population

without power is growing. Eskom is partnering with DMRE as part of universal access to electricity. In this regard, Participant 15 stated the following:

"Where we cannot bring power to customers that are remote, there's something called a microgrid, which is stand-alone. I think it was initiated around 2021 during the COVID time, and there are some of these projects that have been implemented. In KZN, I think we have two, and then there is an area called Enkovukeni where the population is growing, and they are without power, and Eskom is partnering with DMRE." (Participant 15)

The theme *Small-scale renewable energy market initiation for Eskom Distribution* is interpreted by the researcher based on the participants' responses to the related interview question as:

a) The programme began a long time ago but was not fully supported at that time by Eskom. The timing currently seems to be favourable, and the trend shows an increasing interest in the technology by Eskom and by the customers.
b) The process of registration and customer enrolment is new and not fully understood by all, and there is still room for improvement. Government involvement will relieve the discomfort and pressure experienced by customers with the enrolment and registration process, and there is also a need for support to implement the processes by the coordinating bodies, Eskom and NERSA.

The following section will examine the themes arising from the interview question related to the description of the SSEG enrolment and registration process as well as the stakeholders involved.

4.3.3 Theme: Process description and stakeholders involved

The participants were asked to respond to two questions in the interviews, where the responses formulated the theme, *Description of the process, and stakeholders involved.* The two questions that were addressed in the research are:

- *Describe the process involved.*
- *Who are the stakeholders involved, and what is their role?*

Figure 4. 4: Theme: Process description and stakeholders involved

The above Figure 4.3 shows the initial theme and the two sub-themes that are related to the responses given by the participants as they responded to the questions about adoption of SSEG. The responses to these questions are organised according to the sub-themes in the sections below.

4.3.3.1 General description of the process

The participants alluded that there is a drive to expand renewable energy to households to install PVs and solar geysers. Participant 7 said:

"Nowadays, I see they are even increasing more into the households, and where there are households as well, they are more into renewable energy. In the external market, Eskom has been assisting, together with the government, they are installing geysers that use solar power in many areas, which is assisting Eskom to reduce the demand and relieve the pressure on the generation units." (Participant 7)

In further describing the process, the participants cited the need to put policies in place that would guide the process of adopting SSEG, and the government would have to set the rules using these policies. The sector involves different technologies that need to be adopted, thus the need for stakeholder engagement and collaboration in policy formulation. Stakeholders include government agencies, private sector companies, and customers. Participant 4 stated:

"There needs to be policies in place that would guide this, so the government would have to set the rules using policies and a regulatory framework for the risks and the incentives that would be given to the customer, should they feed into the network and technology adoption. There are different technologies that need to be adopted, and then there needs to be stakeholder engagement, collaboration amongst stakeholders, including government agencies, private sector companies, and consumers." (Participant 4)

4.3.3.2 Stakeholders and their roles

The responses from participants in response to the question addressing the stakeholders and their roles are listed in this section. This question aimed to establish whether there is synergy in the market and to possibly identify where there are opportunities that are not being fulfilled.

A comprehensive view of the stakeholders and their roles was provided by the participants. In most cases, they mentioned the same stakeholders and their roles, with the majority mentioning the government, Eskom, developers, manufacturers, and the customers themselves. Participant 6 provided the following view, which encompasses the majority of the stakeholders and their roles as mentioned by many of the other participants:

"This is multiple stakeholders; I think we can maybe just start with the government stakeholders. So, it's the partners like the DMRE, who look at the national energy policies, and NERSA that regulates the energy sector. The South African National Energy Development Institute promotes energy efficiency and the adoption of renewable energy. Then you have Eskom as the main player. Big Municipalities and or local utilities. Then you have your developers. Then you have the manufacturers of the equipment being used by the developers and predominantly in China. Then there's also some local guys as well in Africa, for example, in Upington in Western Cape, where they manufacture these solar panels for use by customers, then you have your banks that provide the financial loans to buy this equipment and then you have your customers themselves that is the end user of the product." (Participant 6)

Participant 8 added:

"…and then we've got NERSA, which is the regulator for the tariffs." (Participant 8)

The participants further mentioned that the customers can initiate the process, but it is the duty of Eskom to make them aware of NERSA regulations and the legal framework under which to operate. They also indicated that Eskom has several internal stakeholders managing the registration process, namely the marketing department handling websites and other marketing tools, customer service, planning, pricing, engineering, and technical services dealing with metering, load flow studies, environmental and monitoring department, legal department for contracting, then pricing, and it is thus important to make sure that everybody that is partaking understands the rules and regulations from NERSA.

Reflecting on the responses from the participants, the researcher's interpretation of this theme is that Eskom plays a pivotal role in ensuring that the customers understand the process and the stages involved to get registered and ensure that all SSEG systems are legal, as well as to identify the stakeholders that need to support the implementation of policies and execution of work in the registration process. Ensuring that the process of legalising customers runs smoothly encourages more generators and participants in the small-scale renewable energy market, which supports the increase in the supply capacity for the needed energy in the country.

4.3.4 Theme: Eskom's reasons to venture into the small-scale renewable energy market

The reasons that drove Eskom to be involved in the small-scale renewable energy market are outlined in this section, based on the responses from the participants. The initial theme, *Eskom's reasons to venture into the small-scale renewable energy market* and the associated sub-themes, as shown in Figure 4.4 below, were generated to provide a view of what the participants had to say as they responded to the question: *Why would Eskom Distribution want to venture into the small-scale renewable energy market?*

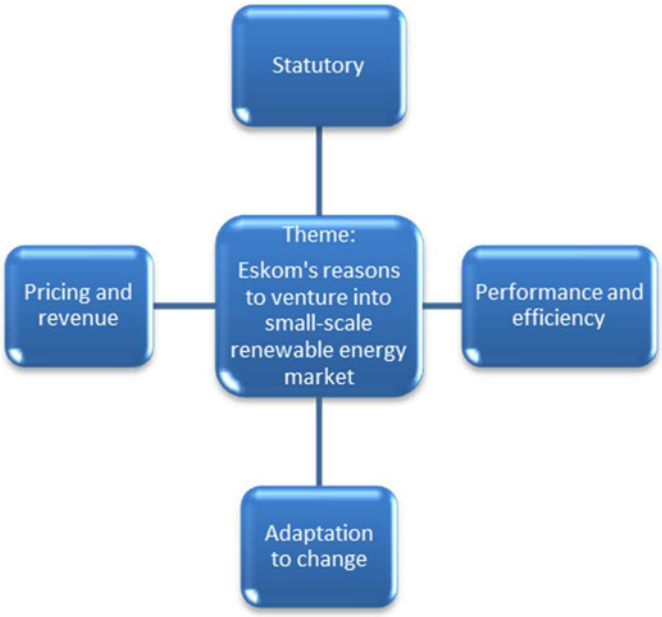


Figure 4. 5: Theme: Eskom's reasons to venture into the small-scale renewable energy market

The responses are organised according to the four sub-themes that were identified during analysis in the sections below.

4.3.4.1 Statutory reasons for Eskom to participate in the small-scale renewable energy market

A participant indicated that the law of the country binds Eskom to provide every user with access to the electricity grid. They further indicated that everybody now has the right to generate their own electricity and connect to the grid if they meet the installation requirements. Participant 20 said:

"According to the laws in this country, Eskom must give every user access to the grid. But having said that, you must comply with the grid code and with NERSA. The electricity supply agreement, which is signed with Eskom, states that you need to get permission from Eskom first, and Eskom does the assessment, and Eskom tells you what size to connect." (Participant 20)

Half of the participants stated that the programme fits into the sustainability development goals to which South Africa has committed, which calls for a significant reduction in the carbon footprint and combating climate change by reducing reliance on fossil fuels. Participant 4's view encompasses the responses:

"South Africa signed an agreement, the Paris Agreement, which basically says it is up to us to contribute towards reducing carbon footprint so we do have to take it that we have to meet this target by 2050 so this will contribute towards that reduction of carbon footprint if we roll out these renewable projects and we will be diversifying energy resources. Additionally, it creates the new business opportunities and jobs within the renewable energy sector driving economic growth, aligning with national and international commitments like the Paris Agreement that I just mentioned as well as the sustainability development of the SSEG to reduce the reliance on fossil fuels and enhance the energy security, and the shift offers significant environmental benefits, and would reduce the carbon footprint and combating climate change." (Participant 4)

4.3.4.2 Performance and efficiency reasons for Eskom to participate in the small-scale renewable energy market

Most of the participants mentioned that a significant reason for Eskom to participate in the small-scale renewable energy market is to reduce generation and transmission losses when customers feed into the system, which reduces load shedding. They further stated that this enhances grid resilience and improves stability and reduces vulnerability to outages. Participant 19 stated the following:

"Acknowledging that we've had a good run, but we've also had a very long bad run, and while we as Distribution are not the generator, our customers feel the load shedding impact the most, and they associate that impact with us. Then the impact affects us as well; loss of revenue, tampering and vandalism of our networks when we are offline, and a whole lot of consequential damage caused by load shedding. So, on

the face of it, we're not at a scale right now to see significant benefit, but eventually we would want to venture into this and encourage the market to grow because we'd want to have the security of supply, and once you have that security and continuity of supply, we have grid stability." (Participant 19)

In further responding to the interview question, the participants alluded that diversification of energy sources in the future will require that energy and generation capacity be greatly improved. If more customers are encouraged to generate energy and export to the system to bank or sell excess of it, then Eskom can save on capital expenditure for building big new plants when extra generation emanates from SSEGs. Participant 6 said the following in this regard:

"If you have an SSEG, you have other supply avenues available to you for your supply of energy. So, we can use that to mitigate load shedding. You can diversify your energy sources in that regard, for your energy mix. Looking from the customers point of view, if you have a small-scale generator at your house, you're able to also as an owner meet household's energy reliability because you can use Eskom or you can use the sun or the wind for your needs. Eskom will also have more energy sources to balance the supply versus demand." (Participant 6)

4.3.4.3 Adaptation to change reasons for Eskom to participate in small-scale renewable energy market

In explaining another reason for Eskom to participate in the small-scale renewable energy market, the participants indicated that Eskom will be forced to keep developing and upgrading itself since there are new players in the generation business. Participants were of the view that Eskom must avoid being overtaken by new players in the market and should be wary of their failure to connect and manage the electricity generated by these new players. The participants stressed the need for Eskom to remain relevant in the market by keeping up with evolving technologies and changing customer needs, as some customers now prefer cleaner sources of energy. Participant 19 narrated the following:

"The key point would be we have to venture into this market as the distribution business to sustain our current business and maintain our revenue to satisfy our customer's needs, then to help enable our future goals of being a cleaner technology company that services our customers better." (Participant 19)

According to the participants, some of Eskom's traditional customers have been lost to independent electricity generation. Eskom thus needs to find new income streams to balance its books. This keeps the organisation on its toes and continuously self-improving. Participant 6 stated the following in this regard:

"Firstly, I'll say with the advent of this renewable energy market our traditional customers sort of moved away from Eskom distribution. So, we're no longer going to be seeing the traditional old customers that we

are giving energy and billing and getting sales out of them. So, we have lost customers and need to find new income streams to balance our books." (Participant 6)

The participants further stated that to remain the market leader in the electricity industry in South Africa, Eskom must have a market share in the renewable energy generation space. They also stated that South Africa has an abundance of sunshine, so venturing into the solar energy sector makes sense. Participant 11 suggested:

"Eskom distribution would want to venture into this market because Eskom is following or adapting to the changing customer needs, whereby customers are now preferring a cleaner source of energy and it is for Eskom distribution to also just gain a market share in that space, that is why they are opting to venture into small-scale renewable energy." (Participant 11)

To promote and encourage an open market where power will come from various sources, the participants indicated that electricity will now be bi-directional rather than the traditional one direction. They also stated that if Eskom does not embrace change and current trends, then the entity will become less competitive as other players will emerge with more competitive pricing. Eskom Distribution can capitalise on its infrastructure and buy at a cheaper rate from SSEGs and sell at a profit. Participant 1 stated the following view:

"I think another thing that we should also involve is to rather buy from the customer because then he will be able to generate more energy. So, we buy from the customer. So, we should change the pricing structure so that we can buy from a customer at a cheaper price than we buy from transmission." (Participant 1)

Participant 10 further gave an assurance that other countries have implemented small-scale renewable energy, and it is working. Participant 10 had the following to say:

"There's a lot of lessons learned from countries that have done this already, for example, Sweden and Norway and Australia is a good example where they deregulated the market and majority of their energy comes from renewable energy markets." (Participant 10)

4.3.4.4 Pricing and revenue reasons for Eskom to participate in small-scale renewable energy market

In the responses provided by the participants, trading opportunities were identified in that if customers cannot use banked energy in standard time, then they could sell to Eskom at a lower price. This will contribute to reducing the price of electricity and Eskom would not have to rely heavily on OCGT diesel

fuel which is very expensive. PV as a renewable energy source is cheap and clean. Participants 1 and 6 narrated the following responses:

"I think there's a lot of these excess energy that would be able to do that because with the banking system they can only bank so much and the issue is they can only use that banked energy at the same time or the same tariff, so it doesn't help the customer to generate too much energy, and we can actually buy that extra energy if we change our tariff structure." (Participant 1)

"The other one that I can think of is that you can save costs because we've seen a phenomenon now happening in the last couple of weeks in South Africa, where we would have been relying heavily on our OCGT, which is very expensive. Now you can actually save costs because there is this integration of small-scale generators that are actually contributing significantly to the supply of South Africa. So that means that Eskom can rely less now on the expensive fuel of the OCGT stations. For new revenue streams, we already have fees in place. Now we can quote you a connection fee or a correct management fee for wheeling. All of that which can provide or give more revenue avenues for Eskom." (Participant 6)

The participants also alluded to SSEGs possibly opening other business, trading line, and revenue streams for Eskom, hence creating business opportunities and jobs within the renewable energy sector to help drive national economic growth. Participant 4 stated the following in this regard:

"Additionally, it creates new business opportunities and jobs within the renewable energy sector, driving economic growth, aligning with national and international commitments, as well as the sustainability development of the SSEG." (Participant 4)

The responses collected from participants indicated that it is important for Eskom to participate in the small-scale renewable energy market. This is so that illegal connections, which rob them of revenue, are rooted out and the connection of privately owned SSEGs to the Eskom grid is managed as they export power into the grid. Participant 9 had the following response:

"It would be important for Eskom to be involved to also make sure that they have control of the grid, because if you don't, then you have issues of managing the whole energy flow and the whole industry, because then you have illegal connections, which would have an impact. It's also important that they are involved because if you have illegal connections that are not known by Eskom, then safety issues would be introduced." (Participant 9)

The above theme analysis gave rise to several reasons for Eskom to participate in the small-scale renewable energy market. The researcher interprets the responses of the participants as stressing the importance of

Eskom, being the main electricity utility, in leading and facilitating the country's transition to clean energy as committed to in various national and international bodies. The support and implementation of small-scale renewable energy, especially on the customer side, will alleviate the strain on the distribution and transmission networks, and further ease up the expectation of fossil generated electricity to adequately supply the energy needs of the country. It is also important that Eskom adequately support the customers as producers of energy whenever possible, without creating bottlenecks such as in the energy banking process.

The following section will examine the second objective of the study and provide responses emanating from the interviews that gave rise to the second initial theme and associated sub-themes that were formulated from the responses.

4.4 Objective 2: To identify the benefits of the small-scale renewable energy market for Eskom Distribution

This section presents the findings related to the second objective which is *to identify the benefits of the small-scale renewable energy market for Eskom Distribution.*

4.4.1 Theme: Eskom benefits

This theme was generated from the interview question posed to the participants to probe the benefits that Eskom Distribution derives by participating in the small-scale renewable energy market. The interview question was: *What are the benefits for Eskom Distribution of taking part in the small-scale renewable energy market?*

Figure 4. 5: Theme: Eskom benefits from participating in the small-scale renewable energy market

The following sections outline the participants' responses that prompted identification of the six sub-themes related to the initial theme, as illustrated in Figure 4.5 above.

4.4.1.1 Energy security

The participants' responses in addressing how Eskom benefits from energy security by participating in the small-scale renewable energy market are outlined below.

The participants indicated that Eskom needs to decrease load shedding by reducing the generation load. The risk of large-scale outages is reduced as the dependency on the current generators lessens. Participant 4 stated the following:

"If you lose a power station and if you have technology such as microgrids, it would not be affected." (Participant 4)

More than half of the participants stated that constrained power supply is a security threat and indicated that at times, Eskom looks at the supply constraint but is unable to address it. Small-scale generators create a virtual power station for Eskom which can be used to capacitate the current grid, as indicated by the participants. The participants further highlighted that there is a need to improve the reliability and security of the electricity supply to customers, which means that there must not be too much strain on the generation and transmission side, because part of the demand is covered. The following views were narrated by Participants 16 and 5 in relation to the security of supply:

Eskom can have an opportunity of using the excess energy which is not consumed by the household. This means to create a virtual power station, and the virtual power station can be used to capacitate the grid in terms of when the grid is constrained, and that excess energy can be used. (Participant 1 of KZN)

"One benefit is that we will remain a reliable source to our customers by reducing the downtime. We're improving the reliability of supply and perhaps in a long term will also see that the cost of electricity might reduce." (Participant 16)

"It's more revenue streams for Eskom, the benefit of zero emissions and the benefit of having a more robust or resilient power system because you have this extra in feed of energy." (Participant 5)

4.4.1.2 Customer retention and market share growth

The participants indicated that Eskom could retain its customers if they make them participate in Eskom power generation - if Eskom ignores them in total, they will disconnect from the grid and operate independently. According to the participants, there is a need to increase the participation of customers in

order to ensure that they are retained, to obtain their trust and to source new customers. They further indicated that increasing numbers of customers want cleaner energy sources, and these customers must be retained as well. The participants believed that Eskom will be able to compete with the IPPs but in order to maintain control of power generation, Eskom must take part in the operations of the small-scale generators. Below are the responses from Participants 19 and 11 pertaining to the benefits of engaging in the small-scale renewable energy market:

"One of the benefits if we actually venture into it, is we might actually be able to retain our customer base by creating this partnership with some of the customers and then the remaining customers who don't want to be SSEG who are just consumers, then trust us again and we're able to actually retain our customers because there's no point in being a distribution business if you have no one to distribute to." (Participant 19)

"Another benefit for Eskom is that Eskom has an opportunity to adapt to the customer activity, because more and more customers want a cleaner energy source." (Participant 11)

4.4.1.3 Revenue and balance sheet elements

The responses addressing how Eskom benefits in revenue and balance sheet elements by participating in the small-scale renewable energy market are listed below.

Half of the participants confirmed that this small-scale energy generation is a new revenue stream. They cited that at one point, Eskom wanted to venture into the telecoms market through the telecoms department, but the project did not materialise. They further stated that small-scale energy generation is an opportunity for Eskom to source additional new revenue generation opportunities from grid services and that they are diversifying the services. Below are the responses from the Participants 4 and 10:

"It's a small-scale, it offers significant advantages, including those savings through reduced operational and maintenance expenses associated with centralised power plants. It also presents new revenue generation opportunities from grid services, and it makes energy demand response a great system management." (Participant 4)

"The main benefit is we as distribution are able to have embedded generation on our distribution networks. So, we can buy this energy at a cheaper rate because it's produced by the small, embedded loads and then we can utilise that and pass the savings on to our load customers." (Participant 10)

The participants also believe that small-scale energy generation can keep the prices to customers lower - those who can afford a small-scale generator will benefit, as well as the majority who cannot. Eskom can also cut out the middleman. Participant 10 explained as follows:

"We can cut out the middleman and if we purchase energy from renewable sources that are at a cheaper rate, it means that we can pass those savings on to our other customers. I think it's important for security of supply. We want to make sure that customers are able to grow the economy." (Participant 10)

4.4.1.4 Organisational and operational matters

The responses below address how Eskom benefits in organisational and operational matters by participating in the small-scale renewable energy market.

The participants indicated that the shift to small-scale energy generation drives innovation, like modernisation in the grid management, and storage solutions like the rising battery energy systems. They further stated that Eskom's workforce will also be trained to equip them to deal with new trends; some will learn how to work with the renewable energy sector. Below are the views of Participants 4 and 15.

"The shift drives innovation, modernisation in the grid management, and the storage solutions." (Participant 4)

"For us to change the way we do things we need to make sure that we have plans in place and also, we are able to measure based on what we've done in each year. There's also the rise of battery energy systems." (Participant 15)

Participant 12 identified an opportunity as she mentioned that the small-scale renewable energy sector is growing, and it presents an opportunity to produce some of the components which allows Eskom to expand or broaden the business into other spheres of engineering. Participant 12 narrated the following:

"It's not just supplying or using, but also an opportunity to produce some of these components, so that we can expand or broaden our business into other spheres of engineering and being the supplier direct to the customers. Customers, when they see Distribution, they see Eskom, so it gives us a better opportunity to market our business and make sure that we can harvest in this space." (Participant 12)

In one of the responses collected from participants, it was stated that the process of shifting to more small-scale energy generation encourages the move towards separating Eskom's business into generation and distribution. The two units will be independent, with transmission and distribution being responsible for integrating the SSEGs. Participant 19 stated the following:

"The benefit immediately would be the independence, especially with the restructuring and new policies kind of splitting the business, we're forced to be independent but also at the same time still reliant on generation. Transmission is splitting. Their independence within our distribution system allows us more freedom for business opportunities and for revenue generation." (Participant 19)

The responses from participants confirmed that renewable energy sources are not located in one place, they are spread out wide and far and can be best harvested by engaging small-scale generators. Participant 12 mentioned the following:

"Distribution has been or is the larger provider of electricity, if you exclude the municipalities now with that broad footprint - various areas offer various opportunities. You'll find the place in the Cape, that has a lot of wind or where you can still have a lot of sun and so forth. So, our footprint covers those areas." (Participant 12)

4.4.1.5 Global trends

The following responses address how Eskom benefits from conforming to global trends by participating in the small-scale renewable energy market.

The participants indicated that participating in the small-scale renewable energy market is about Eskom striving towards zero emissions (clean renewable energy) and the benefit of having a more robust or resilient power system because there is this extra infeed of energy. The participants further stated that Eskom plays its part in adhering to the green energy policy. According to the participants, the future is shifting towards cleaner energy generation and less dependence on burning coal or other fossil fuels. They further mentioned that Eskom will have an opportunity not to pay carbon taxes that come with polluting energy sources – Eskom's carbon footprint will also be greatly reduced. When it comes to carbon emissions, the participants indicated that Eskom is the biggest emitter in the country. Participants 6, 14 and 13 narrated their responses as follows:

"There's also a policy point of view, or a green energy policy point of view. Also, a lot of benefits for us to go into this." (Participant 6)

"We will also be buying less from generation, meaning we'll be burning less coal, which is contributing to a cleaner environment for all." (Participant 14)

"Looking at the future, Eskom will have an opportunity not to pay the carbon taxes because looking at the future, they might be exempted or they will pay less tax, which is a cost saving to the business and that's

what the business is looking towards in the near future for its sustainability and again, Eskom would be in a position to retain its customers." (Participant 13)

4.4.1.6 Grid management and reach

The responses herein address how Eskom benefits in grid management and reach by participating in the small-scale renewable energy market.

The participants indicated that in order to monitor and guarantee safety in the power generation and distribution divisions, Eskom must be involved to make sure that energy is clean and safe for the customers to use. They stated that Eskom must ensure the safety of customers and technicians by getting involved in all electricity generation activities. In this regard, Participant 17 stated:

"The benefits for Eskom distribution on taking part in the small-scale renewable energy market are the safety of our technicians, and, very importantly, the safety of our customers." (Participant 17)

In responding to grid reach, Participant 15 said the following:

"There are areas with network constraints with no conventional energy available. The battery energy storage system can be used for these remote customers. The mixed energy system has been implemented in various countries, and Eskom is following the trend with two successful installations - one in KZN Pongola, amounting to around R10 billion." (Participant 15)

The researcher's interpretation of the participants' responses for this theme is that implementing small-scale renewable energy in the grid or off-grid (using microgrids) will reduce the need to increase the capacity in the fossil energy generation space. These opportunities for customers to participate and generate electricity will help Eskom retain even the customers who can afford alternative clean energy supplies. Eskom also has an opportunity to make new money out of this process through the registration of customers.

4.4.2 Theme: Stakeholders' gain in the small-scale renewable energy market

The theme *Stakeholders' gain in the small-scale renewable energy market* was generated from the interview question that probed the benefits that various stakeholders will have when Eskom takes part in the small-scale renewable energy market: *How do the various stakeholders gain in the small-scale renewable energy market?*

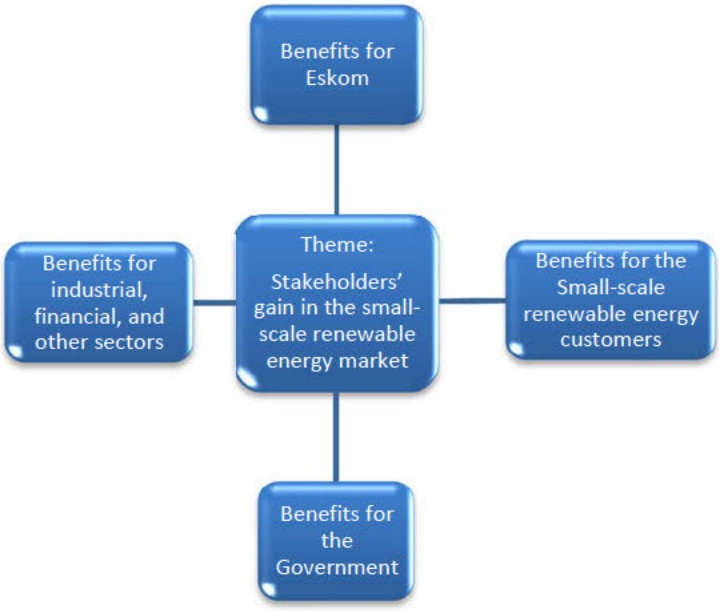


Figure 4. 6: Theme: Stakeholders' gain in the small-scale renewable energy market

The following sections present the participants' responses that gave rise to the sub-themes as shown in Figure 4.6 above.

4.4.2.1 Benefits for Eskom

From Eskom's side, the organisation stands to benefit from taking part in the small-scale renewable energy market in several ways. The views expressed by the participants about how Eskom will benefit are listed below.

In the responses collected from the participants, they indicated that Eskom could gain by saving on expansion capital and increasing profit from the extra energy to deal with loadshedding, and that this is important to the economy. They further stated that Eskom also gets to take part in clean energy generation and reduce its carbon footprint. Participant 3's response is listed below:

"One of the most important things is that we see this as clean energy that is getting put back onto the network." (Participant 3)

According to the participants, Eskom will have reduced demand for electricity, and this leads to better grid safety, as outages present many risks. Safety also extends to, for example, people on the street at night, as most streets will stay lit. The response from Participant 8 is stated below:

"I can also say safety because you know when there's load shedding, there are a lot of things that are happening that are uncalled for." (Participant 8)

In further responding to the question, the participants stated that Eskom can reduce demand-side management during peaks, where Eskom incentivises customers to reduce energy consumption. They stated that this can be avoided if SSEG customers with battery storage systems stay out of the peaks and reduce the need to run expensive diesel generators. They alluded that the disadvantage of this is that some might charge their batteries from the grid, hence creating a new peak. The response from Participant 10 was as follows:

"So, I think the main thing is, from a Distribution point of view, is that in the peaks where we offer programmes such as demand side management, where Eskom incentivises customers to reduce energy; when you have a battery storage system with your renewable energy, you can at least assist to stay out of the peaks. There are advantages and disadvantages because if you need to charge your battery, you create a new peak." (Participant 10)

One participant mentioned that Eskom is also presented with many new opportunities by being involved in small-scale electricity generation. She stated that it can advance in adopting and implementing new technologies and skills. She further stated that engineers and technicians must be upskilled to make world-class engineers and to meet the new technological requirements, and that this would make Eskom a world-class outfit:

"As an engineer, you don't become obsolete, so I think that's the cost there. But in terms of major benefits for Eskom, it's really having skilled engineers who can operate anywhere in the world. It's having a reliable supply, and it's also to save on cost." (Participant 14)

Some participants indicated that Eskom invests significantly in maintaining infrastructure but that the entity does not necessarily see the full usage of the infrastructure. SSEGs might allow Eskom to obtain better returns on investment on the infrastructure assets and, in turn, improve technical key performance indicators (KPIs).

4.4.2.2 Benefits for the small-scale renewable energy customers

The second stakeholder in the small-scale renewable energy market is the SSEG customers themselves. The sentiments expressed by the participants about how the customers stand to benefit are listed below.

More than half of the participants alluded to these issues related to customer benefit for small-scale renewable energy: (i) The SSEG customer (household, public/private facility, etc) can bank their excess energy for later use; (ii) they can use the Eskom network as a cheap battery to store their energy and avoid buying expensive batteries; (iv) they just need to use their banked energy within the agreed time (one month); (v) on their part, they will have continuity in energy supply; and(vi) this will enhance stability and energy security (reliable supply).

The participants stated that the SSEG customers pay smaller electricity bills and will have energy independence as they can escape loadshedding and can even generate some revenue. The responses from Participants 17 and 1 are listed below.

"A customer is getting a lower bill by authorising and legalising their installation." (Participant 17)

"The customer can bank some of these redundant energies to use later. So, they can use our network as a battery, and it's actually a cheap battery, because other battery processes are a bit higher in price." (Participant 1)

The participants cited that the end user, consumers and customers have an option to buy energy from the SSEGs at even cheaper rates - that is freedom to choose alternative sources of energy. They stated that customers can now adjust their consumption habits to suit their needs. Participant 6 stated the following:

"From the stakeholder's point of view, you can generate new revenue. You improve your grid stability and reliability, your financial institutions, like your banks, borrow money from end users or customers, and there is an interest rate." (Participant 6)

According to the participants, customers who opt to legally connect with Eskom will have their installations checked for safety, and they will be guaranteed a safe installation (electricity grid infrastructure (EGI) reports, engineering reports, and the CoC). Participant 17 said:

"They are safe as well, by them legalising, they get CoC, they get EGI reports. (Participant 17)

4.4.2.3 Benefits for the government

The third stakeholder in the small-scale renewable energy market is the government as the regulating authority. The views expressed by the participants about how the government stands to benefit are listed below.

Some participants indicated that the government would achieve policy goals related to renewable energy adoption, carbon footprint reduction, and energy security. They indicated that the government has a global obligation to reduce carbon emissions. They further indicated that Eskom also has to bear in mind the 2050 targets and investing in SSEG, especially the solar PV, is an aspect of this. Participant 4 provided the following response:

"On the government side, they can achieve policy goals related to renewable energy adoption, carbon reduction, and energy security by making sure that we are for clean energy, as well as reducing the carbon footprint of financial institutions." (Participant 4)

In further identifying the benefits to the government related to SSEGs, the participants indicated that another government benefit is that the small-scale energy generation sector has the potential to grow as an industry, which subsequently expands job opportunities. Participant 12 responded as follows:

"It has the potential to grow as an industry, which then subsequently opens job opportunities." (Participant 12)

The participants indicated that government programmes to widen the provision of electricity to the masses can benefit immensely from small-scale energy generation, as remote areas can generate electricity in microgrids. They indicated that energy security is of national concern, and if anything can help the situation, it should be welcomed by the government. They mentioned that some companies have closed down in South Africa due to energy insecurity, so SSEGs would be beneficial in addressing the situation. The government needs to avoid capital flight from South Africa to ensure job security and eradicate poverty. Participant 19 responded as follows:

"If SSEG can bring in that energy security, and can be used as a market, that kind of market to large businesses, large corporations, large companies, international companies to come back and bring their business back to South Africa, we're going to see improvements in the economic status and even economic security, job creation, and reduction in poverty. So, the government as a stakeholder has that to gain." (Participant 19)

Participants further indicated that SSEGs assist a great deal in this regard and can also address some of the socio-economic impact of power outages on households and industries. The government will collect extra revenue. Participant 11 noted:

"If there are no interruptions, the government benefits from SSEGs because they are able to address some of the social and economic impacts that affect both the households and the industries." (Participant 11)

With regard to NERSA, participants indicated that they also have more flexibility in terms of energy policies as renewable forms are new sources of energy that can be investigated. They stated that NERSA benefits from this because the regulator would gain a perspective of how many customers have embedded generators and other electricity information so that they can make informed decisions on processes and procedures in reference to policy formulation. Participant 17 responded as follows:

"NERSA gains from this because it gives a view of how many customers have embedded generators, so that they can make informed decisions on processes and procedures." (Participant 17)

4.4.2.4 Benefits for industrial, financial, and other sectors

The small-scale renewable energy market stimulates activities in many other sectors that include the industrial (equipment production), financial (project funding), and other players. The views expressed by the participants about these sectors regarding how they stand to benefit are listed below.

One participant mentioned that there will be increased opportunities for other support industries and suppliers of equipment to create businesses. Some participants stated that the private sector will see growth in consultancy, design, manufacturing, installation, and maintenance of renewable energy systems. They further indicated that if demand for generation equipment is improved, private companies that manufacture SSEG equipment will be busy developing new products, such as solar panels, batteries, and so on. According to the participants, research and development will also be more active. They stated that the more the renewable energy sector grows, the more manufacturers join, and eventually, renewable energy equipment will become more affordable.

The participants alluded that financial institutions also stand to benefit by financing these renewable energy projects and that municipalities would gain by being part of the trading. They indicated that Eskom would get quotas and could get extra energy from independent SSEGs. Participant 9 stated:

"Municipalities themselves are going to gain out of the whole process in that they will be part of the trading. As I've indicated about the DET, where we will be trading energy, the municipalities will also get quotas.

They'll also get to buy energy from different stakeholders, different SSEGs that would happen in their space." (Participant 9)

The researcher's interpretation of this theme regarding the benefits to both Eskom and stakeholders, based on the participants' responses, is that when Eskom participates in the small-scale renewable energy market, there will be business opportunities for those who will be able to provide their services in this market, thereby increasing job opportunities and improving the economy of the country.

The next section presents the data related to the initial theme and sub-themes pertaining to research the third research objective, which is the last objective of the research.

4.5 Objective 3: To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution

This section examines the findings obtained relating to the third objective of the research. This objective is *to determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution.* Four sub-themes were generated from the participants' responses to the interview questions formulated to address this objective, which will be discussed in the sections to follow.

4.5.1 Theme: Bottlenecks for Eskom Distribution

One of the envisaged challenges for Eskom when venturing into the small-scale renewable energy market is the bottlenecks that may be encountered. These need to be identified and strategies devised to tackle them. The theme that emerged out of the participants' responses is *Bottlenecks for Eskom Distribution,* and the actual question posed to the participants read as follows: *Where are the bottlenecks for Eskom Distribution in venturing into the market?*

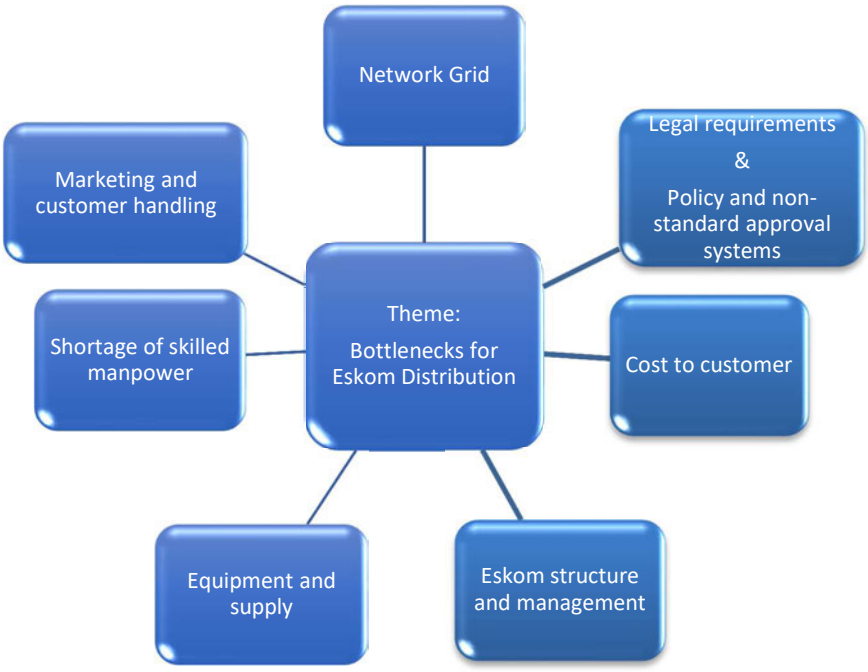


Figure 4. 7: Theme: Bottlenecks for Eskom Distribution in the small-scale renewable energy market

The seven sub-themes that emerged from participants' responses, as shown in Figure 4.7, will be outlined below, and the views of the participants as collected in the interviews will be used to support the themes.

4.5.1.1 Network Grid

In the responses provided by the participants when asked about the bottlenecks for Eskom to venture into the small-scale renewable energy market, they indicated that the existing Eskom network grid configuration did not consider the new developments in the renewable energy market. The views expressed by the participants about bottlenecks related to network issues are outlined below.

Network capacity and coverage on MV lines were regarded as one of the bottlenecks by the participants. They stated that the Eskom Distribution network is designed more for supplying load rather than generation; therefore, the system was built for energy to flow from generation to transmission and distribution, but now the energy flow also operates in the opposite direction, from distribution back to transmission. They further indicated that Eskom Distribution did not expand the networks prior to this new programme; therefore, the network is not able to evacuate that energy because it was built for a small load. This means it might take some time and money to build capacity. According to the participants, there are hundreds of these small plants applying for access. They stated that PV plants opened in remote locations involve significant infrastructural expenses, and Eskom might not be able to purchase this energy, as there are only specific

networks in Eskom's distribution that can receive SSEG power. Participant 4 narrated the following as the response to the question about difficulties with the existing grid:

"Integrating small-scale systems into the existing grid infrastructure can provide or present several challenges. These include technical difficulties in grid integration. Navigating through complex regulatory frameworks and ensuring compliance involves a lot of policies and overcoming financial constraints due to high upfront costs for infrastructure upgrades and technology adoption." (Participant 4)

4.5.1.2 Legal requirements

Like all business ventures, setting up a system must adhere to legal processes at different levels. The views expressed by the participants about bottlenecks related to legal matters are outlined below.

The participants indicated that the electricity generation and distribution space is highly regulated. They stated that regulatory requirements that govern the level to which Eskom can participate can restrict how much the entity can do. They further indicated that the Competition Commission might want to control Eskom's monopoly on energy generation and distribution, hence the commission monitors the entity's operations.

According to the participants, there are many costly legal requirements that need to be adhered to before customers are connected. They further indicated that when there was intense loadshedding, some customers wanted to export energy into the networks but needed to first follow some legal requirements. For a customer to be able to register their renewable energy installations, the participants indicated that they need to obtain a CoC for NEM or normal electricity users, which must be signed off by a professional engineer, which is costly (could be as high as R15000). This presents a major issue for a customer to get an ECC, which is an environmental clearance certificate, for PV. The participants mentioned that a tax incentive from the government might assist with the procurement of equipment. Participant 3 said the following:

"I can recall when we were deep into loadshedding that we had those shops that wanted to put energy into our networks, and there was some legal requirement that had to be done. The same here, there's a lot of legislation that needs to be adhered to. We went to a few customers with the same concept where we have a certificate of compliance for a Normal Electricity User (NEM). These guys also need to have a certificate of compliance, but it needs to be signed off by a professional engineer, which might be a little bit costly, between 8 and 15,000 Rand for such a certificate. So, if there's a real bottleneck, it's very much the legislative side of it." (Participant 3)

When the small-scale electricity generation programme first began, the participants indicated that regulations were not in place, though everybody needed to understand the rules of the market before they

got involved, and Eskom did not initially have clear rules and regulations. Participants also alluded to the registration requirement with NERSA that requires a large volume of documentation that customers need to fill out, and Eskom must ensure that the customers understand what is needed within the stipulated timelines, which takes substantial time. The participants stated that there is a lack of clear regulations by NERSA. Participants 5 and 8 said the following:

"The country was experiencing a problem of load shedding, and we needed to move into the space of renewable energy, but at the same time, the regulations were not entirely in place. Those regulations were in development, so that caused a bit of a bottleneck, because everybody needs to understand the rules of the game." (Participant 5)

"The bottleneck is about the registration with NERSA because there's a lot of documentation that the customers need to fill and Eskom partaking into this, we have to make sure that our customers understand what is needed there and also the timelines that we're having with regards to the documentation that needs to be submitted and some of the consultants are not really doing justice to customers. Some of them are ripping customers off because of a lack of information that they cannot read." (Participant 8)

4.5.1.3 Cost to customer

It costs money for the customer to be properly connected and partner with Eskom in the renewable energy market. Costs are sometimes bottlenecks that can delay implementation. The views expressed by the participants about cost bottlenecks are outlined below.

Customers invest a large sum of money in setting up their generators. The participants indicated that some may spend amounts of between R200 000 and R500 000 on SSEG capital, depending on the size of the systems. Participants 3 and 10 stated the following:

"Customers are saying to us that they've invested well over R200,000 in SSEG capital, and can go up to R500,000 depending on the size. When we go in and engage these customers, the one thing that they ask us is why do they need to pay for an EGI report. It can cost between R10,000 and R20,000 for an EGI report, which is an embedded generator information report." (Participant 3)

Eskom has, in the residential sector, Homeflex, which is a tariff for residential customers that is Time of Use (ToU). Time of Use is a very nice product; however, when customers need to move over to that tariff, we must charge them a tariff conversion fee, and it's about R4000 or R5000." (Participant 10)

4.5.1.4 Eskom structure and management

The general view is that Eskom was not well prepared to harness the renewable energy market. Participants believe that there is still some work to be done to have structured processes to manage the SSEG customers. Some of the perceived bottlenecks are listed below.

On the Eskom management bottlenecks, the following were the responses from Participants 5 and 13:

"Sometimes the roles sort of mix up, and we find ourselves having these irregular customers that are connecting themselves without following what needs to happen. So, it affects us moving in the right direction in terms of this energy market. Another bottleneck that I see in Eskom is that it used to be vertically integrated, and it has got lots of rules and structures, so to change, it needed a change management process to be properly done; hence, I view it as a bottleneck." (Participant 5)

"I think the first thing is that technology has been here, but the issue is that we, as Eskom, did not really take advantage of that when the technology was rolled out, if you look at the fact that it started in 1980. The capital investment regarding this technology is still a challenge. The approval process is long, and it's frustrating to the applicants. The issue of a tariff as well takes longer when a customer applies simply because we're not familiar with the technology and we've got few people who understand exactly how the tariff should be structured." (Participant 13)

On the structural bottlenecks, Participants 16 and 14 stated the following:

"The one challenge is that I don't think we've known how to be the middleman, essentially because I think that's what this is requiring from us to be able to get supply from generators and make money out of it and still make sure that the customer is served." (Participant 16)

The private sector has overtaken us, as Eskom. We are too big. For us to take one step forward, a lot of discussions, deliberations, and approvals must take place before we can decide that we are installing a PV. We have too much red tape in Eskom, so our things will always delay. The delays are putting us out of business. For some reason, the pricing for the Eskom project is always going to come on higher than the rest, which now makes it difficult to say if it's something that we really need to continue doing, because we pay more in any case at Eskom, but if you hear from outside, people are doing this thing with much less. (Participant 14)

4.5.1.5 Equipment and supply

The small-scale electricity market has expanded quite rapidly in recent years, and many manufacturers of the equipment that is needed for generation and connection have emerged. Some of the perceived bottlenecks related to equipment and supply are listed below.

Participant 7 noted a concern related to unreliability of supply:

"Reliability of supply from renewable sources because the sun is not always shining," (Participant 7)

The participants indicated that this limits planning capabilities on the part of Eskom. On the equipment shortage, Participant 8 mentioned the following:

"Sometimes we find ourselves running out of stock in the meters that we are supposed to be assisting in, especially the smart meters. The world is using the smart meters, and we are running short of those for us to be able to assist." (Participant 8)

The participants further indicated that the availability of good quality equipment and materials is not always guaranteed. Some customers resort to substandard installation, which, upon inspection, is found not to meet minimum requirements. They further alluded to the fact that not all structures (roofs) are suitable for PV installations, and sometimes they must convince customers to rectify these issues first before they can start the processes of getting into the small-scale electricity market.

4.5.1.6 Shortage of skilled manpower

There are many new technologies to contend with in the emerging small-scale electricity market. For the effective implementation of programmes in the market, there is a need to have manpower with the requisite skills. The absence of such skills presents a huge bottleneck. The views of Participants 4 and 11are listed below:

There's a need for skilled labour and technical expertise to manage and maintain decentralised energy systems effectively. (Participant 4)

Another bottleneck that is also a bit of an issue is that the technical expertise that is required when one needs to approve an SSEG installation, you need to be registered with ECSA, which in some instances, is difficult to find. A person who is registered with ECSA as a professional technologist or a professional engineer. They are far and few apart, so that also in itself causes some delays within the process. (Participant 11)

The participants indicated that there is still a need for manpower training in the knowledge of renewable energy and government regulations, as government approval is always sought in operations. They further indicated that Eskom does not yet have expert knowledge of the market, which becomes a bottleneck when a decision needs to be made.

4.5.1.7 Marketing and customer handling

Marketing of the small-scale electricity generation programme to some customers and dealing with competition is important for the sustainability of the market share. The views of Participants 4 and 8 on the matter are listed below:

There is limited consumer awareness and understanding of the benefits and opportunities all for you to earn from selling energy to the grid. (Participant 4)

If we can also go out there and do our marketing properly and make sure that we engage all the relevant stakeholders like the industries, the agriculture and segmentations. (Participant 8)

The participants stated that some of the customers are taken by IPPs, which also reduces the customer base.

4.5.1.8 Policy and non-standard approval systems

Some SSEGs need municipal and government approvals before they start Eskom approvals. These are extra bottlenecks that need to be investigated. The views of Participants 5 and 7 on this matter are presented below:

There's lack of political commitment like misalignment in state policies and also non-barriers to investment in the renewable energy. Without indicating maybe directly, we've seen recently, debates in our country where some support that our government must fully fund this, some say not now, this country is not ready. (Participant 5 of KZN)

We provided a quotation which includes meter costs, tariff conversion costs, security deposit unlike residential customer. We've waived some of those costs, but for LPU customers, they still have to pay for all those costs. If the customer does not have that money, they'll obviously delay in paying. Before loading of new agreement and that on its own can take up to about one month, because at least that is within our process, so not because of anybody's fault, but because of the activities that go around it. So, it can delay, it can take up to 12 months to actually get this up and running. (Participant 7 of KZN)

The participants cited that there is a need to simplify and standardise the approval process across all local authorities.

In this theme, the researcher interprets the responses from the participants as indicating that the inability of the Eskom network to accommodate renewable energy generators to sell back their excess energy creates a bottleneck, in that there could be more renewable energy already in the network to alleviate the supply constraints of Eskom. The costs involved in legalising the installations of small-scale renewable energy slow down the speed of growth of this market in supporting the country's efforts to mitigate energy constraints. There is a need for Eskom to train its employees to take over some of the activities in the registration process that customers pay huge amounts for.

4.5.2 Theme: Possible rollout improvements

To solicit possible ideas on how to improve the rollout initiative, participants were asked: *What can be done to improve the rollout of the initiative?* The initial theme that emerged from this question is *possible rollout improvements of the small-scale renewable energy initiative*.

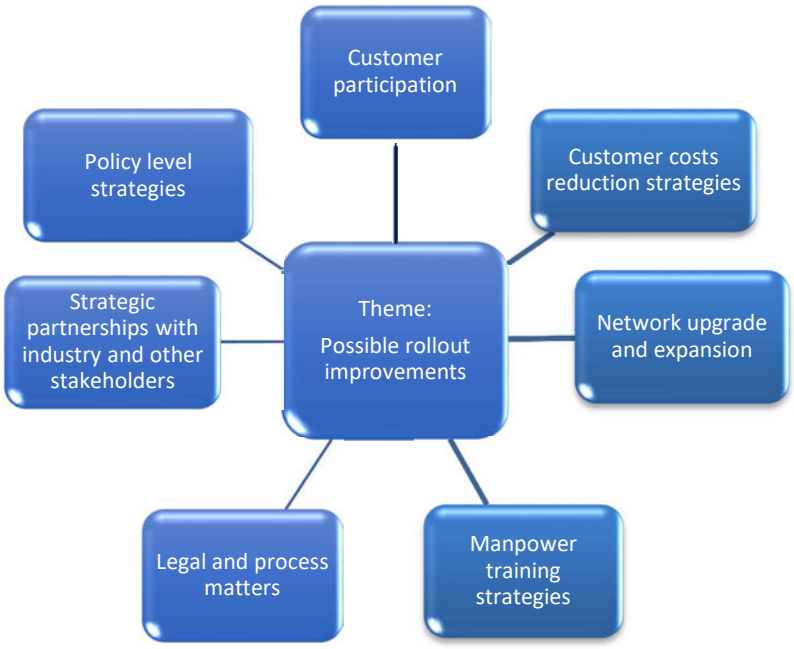


Figure 4.8: Theme: Possible rollout improvements

This question is addressed in the following sections, where participants' responses are grouped according to the sub-themes that were developed, as shown in Figure 4.8 above.

4.5.2.1 Improvement of customer participation

The participants stated that many potential customers are uncertain about what the process is to follow and what Eskom will charge them to install small-scale energy-generating systems; therefore, it is essential to

educate or market to the consumers the benefits and opportunities of participating in this renewable energy space and to foster partnerships with private sector companies. Participant 1 narrated the following view:

"I think we only know of 1% of the customers that have got PV that's connected to our network. The customers are uncertain about what the process is to follow and what Eskom will charge them. So, I would say reduce initial cost in your pricing and then make customers aware that we would like them to participate, and not that we're policing them and trying to catch them out." (Participant 1)

The participants also suggested that there must be incentives for customers to join the renewable energy market, and their installations must be legalised with an amnesty and without penalties.

With reference to improving communication with the customers, the participants indicated that dissemination of information can be done through conferences where various stakeholders come together, and various customers also attend, as well as through publications. Participant 19 stated the following:

"I really think some sort of programme to kind of rebuild our trust and reframe who we are in the customer's eyes would go a long way; it could create that engagement and willingness to participate." (Participant 19)

4.5.2.2 Customer cost reduction strategies

The participants indicated that extra costs to the customer are incurred due to the involvement of third parties (consultants). They further stated that Eskom is missing a very big opportunity, as there are already skills to do most of the work that consultants do; therefore, Eskom can give the customer a one-stop full-service suite, including installation, and create a revenue stream for itself in the process. Participants 3 and 17 had the following to say:

"We know that illegal connections come with remedial charges, maybe waiving those charges for the initial phasing of the programme." (Participant 3)

"Customers take up to 18 months to install the system because this is all dependent on the customer's financial state. So maybe if there could be some financial institutions that are willing to fund customers on these projects as well." (Participant 17)

4.5.2.3 Network upgrade and expansion

The participants indicated that Eskom needs to revise the long-term network and master plans to accommodate customer uptake of renewable energy for the next five to ten or twenty years. They stated

that Eskom needs to start investing in increasing the grid and the upstream networks, including the control centres, to be able to accommodate small-scale renewable energy generators. Participants 4 and 2 stated:

"Investing in grid modernisation and smart technologies will facilitate the integration of small-scale renewable systems." (Participant 4)

"Once you establish how much energy you want to buy, you first build your networks, upgrade the networks so that you say you have available, say 3000 MW of evacuation at a certain area." (Participant 2)

4.5.2.4 Manpower training strategies

The participants stated that there is a need for Eskom to adopt a specific strategy and structure, and to have the right people with the right skills in the right positions of the structure. The following are the views of Participants 10 and 11:

"Our education system, where we have electricians with single-phase and three-phase, we need to start looking at rolling out courses on DC systems. I think that's the one main thing when we do installations that will assist with upskilling and creating jobs in the market. So, I think it's important, we need our education system to look at these new forms of energy." (Participant 10)

"One of the things that can be done is to employ and quickly train competent staff to support the initiative to promote that people get registered. Engineers and technologists to be registered with ECSA so that they are competent to actually sign off the technical evaluations, and probably for the government to have a funding model of sorts to assist in the capacity building within distribution." (Participant 11)

The participants further stated that Eskom needs to train internal human resources for skills transfer. They stated that there is a need to have contracts for training programmes and training manuals that are to be always in place.

On the construction side, the participants indicated that the installation technicians need to be properly trained for efficient installation.

4.5.2.5 Legal and process matters

The participants stated that all stakeholders must be involved in the improvement of regulations. They further stated that there is a need to simplify and unlock the process from NERSA so that the ordinary customer can understand it. Participant 15 stated the following:

"The customer must apply with NERSA for either registration or a license to operate their generator or with their local utility, depending on the size, and after NERSA, they will go to Eskom and require information to ensure that the grid is still stable and is safe to connect." (Participant 15)

The current connection process, as viewed by the participants, is cumbersome and discourages customers. Participants 8 and 9 had the following to say:

"Even though Eskom is there, the customers would like to hear from the NERSA side. NERSA should also be out there to make sure that this small, embedded generators roll-out initiative is known." (Participant 8)

"Simplify the processes in between, because Eskom operates in a regulated space, so there are a lot of checks and balances that are done to try and prevent any corruption, and in the whole process, created too many regulations, so the regulations need to be simplified." (Participant 9)

According to the participants, the establishment of the DET and the DSOs is taking longer than anticipated. The participants further indicated that NERSA needs to establish clear wiring regulations and needs to clarify the house wiring code so that it is geared towards the promotion of renewable energy electricity generation sources.

4.5.2.6 Strategic partnerships with industry and other stakeholders

The participants suggested that manufacturers of renewable energy equipment need to be made aware of the need for their products because the demand is very high. They stated that if local production of this equipment can be initiated in the country, it will reduce delays due to shortages. They indicated that customers are facing delays when they must wait for imported supplies, so there is a need to secure the suppliers of the technology being used. Participants 4 and 17 stated:

"Probably this is essential to educate the consumers about the benefits and opportunities in this renewable space or renewable energy, and fostering partnerships with private sector companies, financial institutions, academic institutions that will be doing their research and development, which can drive innovation, and possibly additionally develop training programmes." (Participant 4)

"With regards to the tariff conversion, in terms of the material, we should order the material in time. Eskom would need to streamline the process whereby we order material in time, we appoint our contractors in time, so that there are no delays, and that will improve communication with our customers." (Participant 17)

The participants also indicated that financial institutions could give access to loans to purchase equipment at a lower rate, or long-term, low-interest rates. They stated that strategic partnerships might assist with the rollout and increase the rate of uptake of the opportunities.

4.5.2.7 Policy-level strategies

The participants mentioned that a national policy framework and a funding model to incentivise households or small industries that want to take up SSEG but cannot afford the technology would be another positive initiative, and the funding model can subsidise the customers. In this regard, Participant 12 noted:

"We need to capacitate the teams that are party to this and probably have a dedicated team that focuses on this and this only, not just at the Research level, but at all levels, including implementation and designs, so that we can move quicker and make sure that we cover all the areas." (Participant 12)

The participants suggested that Eskom needs to draw some lessons learned from other countries that have already taken these measures, for instance, by working with external stakeholders who come in and generate energy, and avoiding red tape. They further suggested that the government can provide incentives for the public to invest in their own facilities to generate renewable energy. Participant 19 said:

"We have our historically entrenched traditional businesses in distribution, and we have the future, and the future doesn't always match very easily with what exists. So, you must create structures around the things you want to integrate to move us forward." (Participant 19)

It is critical for Eskom to get customers to willingly participate in the renewable energy market more so than they are currently doing. This will be possible once the registration process is better understood by the customers and is easy to access and complete at reasonable costs. Investing in the grid modernisation and upgrade will streamline and simplify the connection process of customers and will allow Eskom to partner with customers to participate in the small-scale renewable energy market. A pool of well trained and registered employees will support the installation testing and authorisation for the customers to avoid paying large sums of money to a third party to perform this work.

4.5.3 Theme: Recommendations for accessibility to Eskom Distribution

The participants were asked to offer their recommendations on how to make the small-scale renewable energy market more accessible to Eskom Distribution. The interview question posed was: *What recommendations do you have to make for the small-scale renewable energy market to be more accessible to Eskom Distribution?*

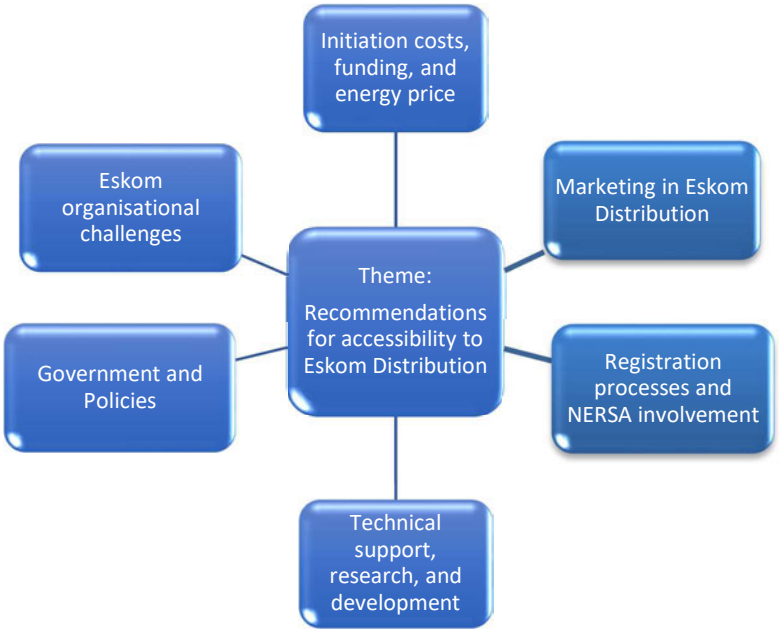


Figure 4. 9: Theme: Recommendations for accessibility to Eskom Distribution

Figure 4.9 above shows the initial theme and sub-themes that were generated from the participants' responses. The sub-themes are reviewed in the following sections.

4.5.3.1 Initiation costs, funding, and energy price.

The participants alluded to the fact that Eskom needs to investigate ways to reduce the capital investment needed for small-scale renewable energy generation because it is currently pricey. They indicated that Eskom distribution needs to think about cheaper ways to get Pr. Engineering sign-offs, as homeowners pay from R10 000 to R12 000 for an EGI Professional engineer report sign-off from the consultants. Participants indicated that there may be people in Eskom who can perform the valuation, inspection, and sign off as required by NERSA, as customers already pay large amounts just for the equipment. They further stated that the residential sector in South Africa is the most fragile and most sensitive sector when it comes to prices. The following view was narrated by Participant 20:

"If you're looking at the homeowner and you're asking for an EGI, for an engineer to go to someone's home and sign off that report, it's like 10,000 Rand, 12,000 Rands." (Participant 20)

The participants suggested that Eskom should give customers an attractive price for the energy they generate. Participant 2 suggested:

"The free market point of view is to make your pricing of such a nature that customers are willing to sell the electricity to Eskom, and they need to also give some cost incentives where we might be able to control the inverters of the customer." (Participant 2)

4.5.3.2 Marketing matters of small-scale renewable energy sources in Eskom Distribution

The recommendations of Participants 18 and 7 regarding marketing the SSEG programme in Eskom Distribution are stated below:

"I think we have recently been doing a lot of workshops to educate the customer, making sure they understand the guidelines." (Participant 18)

"Customer service actually also talks to the customers to advertise distribution and the benefits of the customers connecting to the renewables that distribution will be venturing in." (Participant 7)

The participants suggested that Eskom sell the SSEGs in different formats (different packages according to customer profile). Participant 12 suggested:

"Design what is fit for specific sites or different areas or communities, because not everything is common, particularly in this space." (Participant 12)

According to the participants, the Eskom-customer relationship needs to improve. They stated that Eskom needs to change the relationship with its customers. The following was narrated by Participant 19:

"It ties back to changing our relationship with our customer and how they see us, but we need to be out there saying this is the way forward. They need to hear it from us so that they don't feel that they're an island on their own. So, we have to adjust the distribution business to be the leader in saying this is the future. This is here to stay for our customers. This is here to stay. Get on board, you know." (Participant 19)

In a reflection on what worked in the past, Participant 3 indicated that there is a need for a specialised unit in Eskom to talk to the customer and market the production of electricity. He mentioned that the specialised unit or dedicated structures will have specialist knowledge, and they will engage with customers to have a clear view of their needs. The following is a narration from Participant 3:

"If you looked in the 1980s when we marketed the excess generation, we had like AGRILEC and INDUSTRYLEC. There was specific specialised legs in Eskom to talk to the customer and market the product of electricity, so I think we do need that in distribution, we do need that specialised units with specialised knowledge that can market this to the customers and come back with some suggestions from the customers on how will we give the customer an appetite to sell the electricity to Eskom. So, that's the two-

way communication where you have specialised units that talk to the customer, and they get inputs from the customer back to Eskom." (Participant 3)

4.5.3.3 Registration matters involving NERSA

To attract more generators and users of SSEGs, the participants suggested that Eskom needs to simplify the registration process, especially the legal aspects. They indicated that there is still too much red tape, and that the registration process should not be that expensive. Participant 4 said:

"If we can do away with some of the red tape but not compromising the quality of the product, then that will already go in a sort of a better way, or open the market for more customers to come in, because what we also found is that as soon as customers have all these renewable energy equipment, they tend to move off grid immediately because of all the red tape." (Participant 4)

Participant 20 mentioned that NERSA should not be so detached from Eskom, saying:

"There's nobody from Eskom distribution who really talks to NERSA. So, like now, sometimes we need NERSA's registration, so there should be somebody from Eskom who engages NERSA, knows the people from NERSA, and is able to talk to them and maybe tell them to meet more than once a month to evaluate the applications. Register the systems." (Participant 20)

Participant 15 suggested that municipalities and Eskom should take over the NERSA applications on behalf of the customers, and elaborated:

"Those interested should direct them to their local utilities, whether it's the municipality or Eskom, depending on who's providing the service, for registration and local utilities to run the full process. So, in a nutshell, if the customer is tapping from Eskom directly, and as soon as he has called, the customer applies, Eskom must run the full process and provide NERSA with all required information instead of the customer applying for the license." (Participant 15)

4.5.3.4 Technical matters, research, and development

The following responses from Participants 5 and 6 provide insight into their views regarding the recommendations related to technical support, research, and development:

"We need to offer Technical Support and resources to help consumers and businesses adopt renewable energy technologies." (Participant 5)

"I will also suggest we work more closely with institutions. This is the university, to see how we can use our experience versus their academic resources to see how it can provide a better product to our customers.

Right now, everything we're using in terms of this technology is being imported. The majority, at least some of them, are locally manufactured. I think Eskom has a lot to offer in terms of experience and in terms of how we can improve that, maybe even produce a cheaper battery that is tailor-made for a South African PPU household." (Participant 6)

As evidenced from their responses, participants mentioned that apart from the technical side of the market, there are also social and economic matters to consider. Participant 12 said:

"For us in making it fit for our space, it's not just the technical side, but also, the social and Economic aspect of things because remote areas, for example, you'll find that it's very difficult to monitor, but if you do your social study properly and you market it, then it becomes the communities responsibility to look after the asset, at least from vandalism and theft point of view and then you know, if you invest in that, it's an investment that will remain there, be looked after, and yours is just to operate and maintain." (Participant 12)

4.5.3.5 Matters related to government policies

Participants noted that improving planning policy by introducing schemes to cater for SSEGs, improving skills and having guidelines in place would make the cost of installation less prohibitive to customers. Participants 11 and 17 said:

"One of the levers could be to strengthen the national planning policy as a whole, and that can be done by probably introducing a funding scheme of sorts to cater for the SSEGs. The strengthening of local skills is also another factor that needs to be considered, and to have proper guidelines in place when it comes to the procurement of accessories that are to be used for SSEGs." (Participant 11)

"If the current government could reduce some of the import taxes for solar panels and converter batteries, so that it's not too expensive for the customer." (Participant 17)

The participants suggested that Eskom also needs to start examining how it can entice customers through other options. Participant 10 stated the following:

"We need to look at the unregulated business. We only have a regulated business of selling kilowatt hours and stay out of the market. By unregulated, I mean we need to start looking at how we can entice customers through other options like Magnificent Seven. We had such nice programmes, such as the green energy tariffs. We now have nice programmes that we are developing called green attributes, so these are mechanisms that we can utilise in Distribution to get money. If you look at countries like Europe that want to charge countries like South Africa, Brazil, and India high taxes because they use coal in their production,

which means we can't sell our products or are not competitive. Green attributes allow SA to export products to the EU by showing our commitment to reducing emissions. Distribution can offset black energy with this green energy, which makes us competitive as a nation and in other countries as well." (Participant 10)

4.5.3.6 Eskom's organisational challenges

Regarding recommendations that can be made in terms of Eskom's organisational challenges, Participants 8 and 10 stated:

"The change management drives in our organisation that we need to make sure that we do that religiously and frequently, and also not to rush. When we rush to implement certain things, we miss certain things that we have to do. We really need to do the quality talks and investment in what we want to implement so that we don't miss anything, and that our teams, even management, and all of us are together in this. We understand what we're starting, where we're ending, and everybody is capacitated and skilled. Then we can run with the things that are happening at the moment." (Participant 8)

"We need to upskill our current workforce. For as long as we only think of Distribution as wires and Transformers, and we're not looking at renewable energy technologies, it will make Distribution stay out of the market for small-scale renewable energy." (Participant 10)

Other participants suggested that Eskom can facilitate rental of spaces where PVs can be installed, including the surface area on top of buildings. They indicated that some customers might have the will to run SSEGs but lack land and space for such projects. Participant 13 noted:

"We also need to look at developing the installation and maintenance strategy for Eskom to embark on this. It must not be regarded as one of the things that you can add in on the operational space, but rather be driven as a project." (Participant 13)

Based on the above responses outlined from the participants, the researcher's interpretation of this theme is that there are consistent points that emerge strongly from the data collected in the research, that justify the importance of Eskom participating in the small-scale renewable energy market. These are:

a) The cost of registration, which can be reduced if Eskom can perform some of the costly activities internally, such as the reports and authorisation of customer installations. Training of Eskom employees is key in this decision.
b) Dealing with process delays, such as the NERSA activity that takes up to 6 months.
c) Making the trade profitable for the customer in the process of banking the excess energy generated.

d) There is a need to market the product and educate customers to encourage them to willingly participate in the small-scale renewable energy market.

e) The more participants there are in the small-scale energy market, the less energy theft will occur and equipment vandalism will be reduced, as there will be more ownership of the infrastructure, without it being monopolised by Eskom.

The next section will conclude the data presentation of this research by providing an overview of the other matters related to the harnessing of small-scale energy generation identified by participants.

4.5.4 Theme: Other matters of the small-scale renewable energy market in Eskom Distribution

In this section, the final initial theme relating to *other matters of the small-scale renewable energy market in Eskom Distribution* is discussed in line with the participants' responses to the interview question that read: *Do you have anything else to add regarding Eskom Distribution's initiative to participate in the small-scale renewable energy market?*

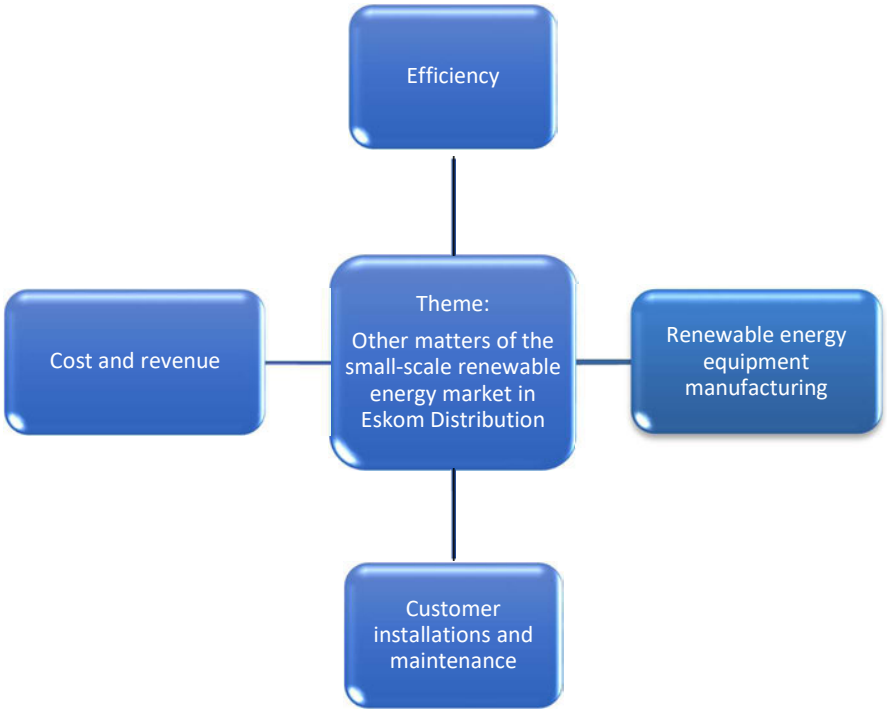


Figure 4. 10: Theme: Other aspects of the small-scale renewable energy market in Eskom Distribution

Figure 4.10 above shows the initial theme and the related sub-themes generated from the participants' responses to this question. Below is a summary of the findings corresponding to the sub-themes that arose from grouping the responses.

4.5.4.1 Addressing efficiency

The participants stated that Eskom must expedite its legal processes and avoid red tape. They further stated that Eskom needs to be more eager to give customers access to its grid by improving the entity's marketing and informing the customer how the process works. This would reduce customer fears of approaching Eskom and discourage instances where customers quietly set up their off-grid solar installations without informing Eskom and following necessary processes. Participant 2 stated:

"There was specific specialised legs in Eskom to talk to the customer and market the product of electricity, so I think within Eskom, we do need that specialised units, with specialised knowledge that can market this to the customers and come back with some suggestions from the customers on how will we give the customer an appetite to sell the electricity to Eskom." (Participant 2)

According to the participants, Eskom needs to improve aspects such as turnaround times, effectiveness, and efficiency. They stated that Eskom needs to act quickly because the move towards green energy is rapidly evolving and therefore requires institutional support from top management.

4.5.4.2 Drive towards manufacturing renewable energy equipment

The following views were tabled by Participants 7 and 4 regarding the need for Eskom to be harnessing resources such as land, and promoting the manufacturing renewable energy equipment:

"Where we are having our own substations, we can acquire some land in order to build some of the renewables closer to our substations, so that when the renewables are charged, then at least we can be able to feed from the renewables from a closer range." (Participant 7)

"The success of this will require coordinated effort from all the stakeholders for continuous innovation. Institutions like universities come in with the need to invest more in research and development to make sure that we come up with more technologies to implement and leverage the benefits by addressing the bottlenecks." (Participant 4)

According to the participants, Eskom should be allowed to manufacture the PV's and batteries within the SSEG space.

4.5.4.3 Customer installations and maintenance

Participant 3 provided the following view on customer installations and maintenance:

"Expanding our scope, why don't we do some maintenance on these panels? Why don't we do some maintenance on the inverters? To give that extra cost where the customer can also be charged, but at the same time, the customer is relaxed that it was done by a proper Eskom employee, so there cannot be any comebacks." (Participant 3)

Participant 1 added their view in terms of Eskom inspecting installations for quality:

"Inverter must be very safe these days and if inverter is not safe, after the first outage or first load shedding event if the power comes back and that inverter is not safe it won't push back in the network and maybe shock our people when they do maintenance, that inverter will explode first time the power comes back." (Participant 1)

4.5.4.4 Cost and revenue insights

The participants stated that currently, renewable energy is out of reach for low-income households in South Africa. They stated that South Africa has a high rate of unemployment, but still needs a customer base to have access to renewable energy. Even in the deep rural areas where there are schools that might not be able to afford this type of technology, government incentives can help. Participant 10 stated the following:

"National Treasury also has nice programmes like the Bounce Back initiative scheme that simply says, even if you go to the bank and you're not creditworthy, we can, as National Treasury, cover you for up to 20%." (Participant 10)

The participants further reiterated that the EGI, the engineering report, is too expensive for most customers, and it is a stumbling block for most potential customers. They stated that if this could be rectified, it would improve situations. Participant 18 provided the following response:

"We found ways to incentivise customers to become legal. I think one of the biggest quests specifically for residents now, one of the biggest costs is that R10,000 for that certificate, which I think we need to find other innovative ways for customers to get those certificates." (Participant 18)

The participants further explained that the rules are that customers cannot export more power than they use. They indicated that Eskom could allow customers to bank excess energy generated, but they charge exorbitant administrative fees for banking this energy. According to the participants, these fees are excessive. Participant 20 tabled the following response:

"We have done some analysis of some accounts, you'll find that those customers who export a small amount of kilowatt hours, the admin fees are higher than the offset value. Eskom should relook at the pricing if they want to have more customers participate." (Participant 20)

Reviewing the responses from the participants related to the final initial them identified, there is emphasis on the improvement opportunities related to improving efficiency of the registration process, which includes increasing grid access, mediating the NERSA process, and the establishment of a dedicated department to deal with renewable energy. According to participants, the process must be easily understood and accessible to all levels of customer segments, even low-income earners. Eskom needs to drive localisation of equipment and materials for SSEGs and consider offering maintenance services to customers to reduce the installation costs of small-scale renewable energy technology.

4.6 Conclusion

Findings were presented in this chapter as drawn from the data analysis captured from the participants' interviews. The findings were presented in line with the research objectives, aligning with the interview questions posed to the participants. The views of the participants were grouped into common themes according to the responses gathered from the interviews. Participants expressed their views on Eskom Distribution's participation in the small-scale renewable energy market. They provided their views on the benefits, challenges, and recommendations on Eskom Distribution's participation in this market. Generally, there is a strong view from the participants that it is a beneficial and long-awaited initiative for Eskom Distribution to participate in the renewable energy market. The next chapter presents the discussion of the findings in relation to the literature reviewed in the study.

CHAPTER 5: DISCUSSION

5.1 Introduction

The previous chapter presented the findings drawn from the data collected during the semi-structured interviews, and offered a brief interpretation of the findings. In this chapter, the findings of the study are discussed in greater depth, by contextualising the findings in relation to existing knowledge already available for this research study, as reviewed in Chapter Two of the study. Points of commonality as well as points of contradiction will be elaborated upon in the discussion of the study findings in relation to the theoretical underpinnings of the research and the results of previous empirical research. The layout of the chapter, as in Chapter Four, proceeds in line with the objectives of the research that were outlined in the introductory chapter of the study. The objectives of the research are thus the basis of the discussion of the study findings and guide the format of the chapter.

5.2 Objective: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution

The first objective of this research is *to identify the importance of participating in the small-scale renewable energy market for Eskom Distribution*. In the four questions posed to the participants in the in the interviews that addressed this objective, their responses and the themes that emerged were grouped and reported in the presentation of the findings in Chapter Four. A comprehensive discussion of these findings is presented in the sections to follow.

5.2.1 Theme: Small-scale renewable energy market description for Eskom Distribution

The following discussion analyses the responses from participants related to the first theme identified, which pertains to adding to the available literature for the description of small-scale renewable energy market, aligned with the first objective of this research.

5.2.1.1 Nature and size of small-scale renewable energy customers

On the nature and size of the small-scale renewable energy generators, the participants indicated that these generators are based on sources such as PVs, wind turbines, micro-hydro, and biomass. Eskom Distribution refers to small-scale renewable energy generators as small-scale embedded generators, whereby one participant explained that not all small-scale embedded generators are from renewable energy sources, though the majority do generate electricity from renewable energy sources. The participants further indicated that typically these systems are installed by small independent producers at schools, clinics, commercial, industrial, agricultural, and residential sites. Birhanu (2023) stated that these sources of renewable energy can resolve the issue of non-electrified rural areas, which are located far from the formal

electrical grid, which therefore makes grid extension cumbersome. The participants also mentioned that there are two categories of the small-scale renewable energy Eskom programme: Low Voltage (0-350V) and Medium Voltage (350-1000V). There is not enough literature on the categories mentioned by the participants for the Eskom SSEG project. An earlier study stated that small-scale renewable energy is 100kW (Terrapon-Pfaff et al., 2014). The South African Distribution Code approved by NERSA and the Association of Municipal Electricity Utilities document for SSEG Requirements also state that Low Voltage is up to 1000V, and Medium Voltage is up to 44kV and further explained the SSEG capacity to be up to 1000 VA or 1 MVA (Eskom, 2022a; SALGA, 2020). The participants further indicated the categories of SSEGs such as A1 and A2. Van Eck, Bekker and Chihota's (2021) thought concurs with this explanation and further elaborates the categories as indicated in Table 5.1 below.

Table 5. 1: South African grid code for renewable energy plants categories *(Source: Van Eck et al., 2021: 1)*

Category	Voltage level	Generator Size
A1	LV	0 – 13.8 kVA
A2	LV	13.8 kVA – 100 kVA
A3	LV	100 kVA – 1000 kVA
B	MV	1 MVA – 20 MVA (or smaller connected to MV)
C	MV+	20 MVA +

5.2.1.2 Operational process of the SSEG programme

Participants stated that customers who come to Eskom seeking assistance with registering a small-scale renewable energy system are taken through a process meant to facilitate SSEG customer applications. They further stated that the energy generated is mostly for self-use, with options of connecting to the grid (grid tied), or not (off-grid) or hybrid (using Eskom source when there is not enough available renewable energy source). Participants noted that these options may allow customers to create a new income stream in their business or to generate energy for personal use. There are numerous theories that support this response from the participants. Oliver (2021) stated that developments such as SSEGs trigger socio-technical transitions with deep structural changes to the system, resulting in complex infrastructure reconfigurations and transformation of technology, policy, knowledge, and social practice. Previous research by Kekana (2020) found that increased economic opportunities are brought about by renewable energy in Sub-Saharan Africa, which includes South Africa, where communities can sell electricity amongst each other. This substantiates

the participants' views that SSEGs can broaden economic opportunities available to Eskom customers in South Africa.

Participants also alluded to the opportunity for the customer to bank their energy for later use within the same tariff and to offset their bills by selling excess energy generated by their renewable energy plant back to Eskom. In a study undertaken by Eskom (2024b), it was highlighted that customers are able to sell the electricity they generate in excess back to utilities such as Eskom. The scholarly literature refers to energy banking as energy storage, the majority of which is undertaken in the form of battery storage (Al-Ghussain, Samuu, Taylan & Fahrioglu, 2020; Sayed et al., 2023). PV Consult (2024) refers to the same term as the participants and explains banking as the treatment and carrying over of banked energy into the Eskom system as recorded within a specific Time of Use (TOU) period and month, which the customer is not able to consume within that month for any reason. Heeter, Vora and Mathur (2016) further discussed both wheeling and banking of energy in their article and pointed to the fact that in some markets, when a generator is wheeling electricity, the electricity can actually be banked to be consumed by a customer at a later period.

5.2.1.3 Factors driving the programme and Eskom's participation in the process

According to the participants, Eskom's supply constraints, which resulted in load shedding from 2007, as well as the increase in electricity cost, drive the implementation of the small-scale renewable energy programme initiated in Eskom. A study by Lawrence (2020) indicated that the cost of solar and wind power generation has plummeted, thereby making the selling price lower than fossil fuel generated power. The participants mentioned that the price of PV installation offers customers a choice to select between power supplied by Eskom or the SSEGs. This, as described by the participants, is supported by the government's PV policy, which aims to deregulate the Eskom monopoly. There is strong evidence in academic literature and theory that supports the participants' views regarding the factors driving the rollout of small-scale renewable energy in Eskom. Uzum, Onen, Hasanien and Muyeen (2020) stated that the rising effects of global warming and the increase in energy demand has intensified the interest in using small-scale renewable energy sources. Mkhwebane and Ntuli (2019) forecasted a rise in the installation of small-scale renewable energy as a result of load shedding and electricity price increase. Mabunda (2021) indicated that the increase in electrical energy demand has resulted in consistent load shedding in South Africa and renewable energy, solar PV in particular, is a simpler solution to the electricity constraints within the residential market.

Participants mentioned that Eskom is still in the early stages of implementing renewable energy solutions, micro-grids being one of the options. Kekana (2020) stated that off-grid electrification, which includes

micro-grids, is one of the untested resolutions to improve the energy reach and economy in rural areas, hence Eskom's involvement in the renewable energy drive. Motjoadi et al. (2020) concur that Eskom has an opportunity to install PV microgrids in the rural areas where it is difficult to extend electricity supply to places that are far from the grid. The participants in this study, however, indicated that the network is not ready for the bi-directional energy flow that is required when connecting renewable energy generators; therefore, this requires network upgrades and registration of SSEG installations for electricity planning and for the safety of employees and customers in cases of reverse direction of energy flow. Baker (2017a) argued that the Eskom grid cannot integrate renewable energy technologies into the grid as they require bidirectional supply. The implementation was deemed to be slow by the participants, as the private sector is taking over. Mandi tereza and Bansal (2016) stated that the global deregulation of the energy sector resulted in increased participation of small to medium IPPs, which has subsequently resulted in a drop in electricity generation costs and a 56% rise in renewable energy capacity, adding to global power capacity.

5.2.2 Theme: Small-scale renewable energy market initiation for Eskom Distribution

The discussion in this section is related to interview question two pertaining to objective one of this research. The discussion is aimed at establishing when the small-scale renewable energy technology was discovered and when Eskom and the South African government began considering it as a solution to reduce carbon emissions and improve the capacity constraints of electricity generation and supply.

5.2.2.1 Approximate timing of the programme and trends

According to the participants, small-scale renewable energy technology was commercialised in the 1980s in South Africa. This is in line with Mkhwebane and Ntuli's (2019) findings, who stated that South Africa's first solar PV installation was in the 1980s in the rural areas that were located far from the grid. They propose that installations peaked between 2015 and 2021 in South Africa, which was when the national regulatory standard (NRS097), the grid connection code for renewable power plants that allows connection to the electricity network without performing detailed network design studies (Mararakanye, Kritzinger, Steyn & Rix, 2018; SSEG, 2024), was released. NERSA and DMRE approved the IPPs within the same period.

The participants further indicated that the concept of renewable energy sources was included in the South African IRP of 2018/2019 which is South Africa's policy vehicle used to increase the footprint of renewable energy in the process of electricity system transition to renewable energy sources (Senatla et al., 2024). The earlier studies indicated that the IRP (2023) was revised and released in 2024 by DMRE and is the key enabler of the implementation of energy restructuring in the country. According to the participants, there were few takers of the technology at that time. SSEG is still deemed as new by the participants, though

Eskom has made some progress to integrate it into the billing system and teams such as the engineers and network planners have been roped in to work on the project. The participants also pointed to the power outages contributing to fast-tracking the implementation of renewable energy sources between 2015 and 2022, which aligned with the approval of LV embedded generators and role clarity for Eskom in the small-scale renewable energy market. Participants indicated that the big drive of the Eskom SSEG project started in 2023, with proposals of the incentive schemes to encourage customers to register and legalise their installations.

5.2.2.2 The process of enrolling customers, government involvement, and other matters relating to the SSEG programme in Eskom Distribution

The process of enrolling the customers is outlined by Bhattacharyya and Palit's (2021) and van Schalkwyk and Scholtz's (2024) explanations of the process. According to the participants, customers had installed the PV plants for personal use without consulting Eskom, as some deemed it cumbersome to do so. Some participants stated that Eskom is now reaching out to customers to legalise their installations. They indicated that customers who have already installed the renewable plants are identified using geographical maps to proactively approach them to register and legalise their systems. A participant stated that some customers reach out to Eskom through telephone or walk-ins at the head offices. The participants also stated that the customers are encouraged to come through so that they are educated on the process to follow with Eskom to register and to enlighten them on the possible safety matters related to the renewable energy installations.

According to the participants, in the past there were not enough policies and procedures to support the programme but slowly these documents have been established to support businesses in preparing the network to allow the energy generators to connect to it. This view is supported by a study of the policies, policy enablers, and regulations governing renewable energy, which is government support for the initiative of introducing renewable energy into the electricity network in South Africa in this research. The insight from the participants is that some customers approach Eskom through the bidding process, mainly for IPP. De Barros Correia, Tolmasquim and Hallack, (2020) stated that the IPP bidding process is complex though it provides clear and fair prices and adapts to different market designs. As previously alluded by the participants, SSEGs are not keen to engage on complex processes. In the Eskom SSEG programme, there are two processes to conveniently register and legalise the customers as mentioned by the participants, which are the LV and MV processes, regarded as minor and major process respectively.

In view of government involvement in the small-scale renewable energy market, some of the participants indicated that the government policy driven by NERSA to regulate the process encourages growth in the renewable energy market. The participants also indicated that a CCA, defined as a community choice

aggregation - a legal idea that allows municipalities to combine their customers and their load (electricity they use) to form local public electricity providers administrated by elected officials from those communities - is needed when connecting to the grid (Karpa, 2023). Pandarum and Mbam (2023) also express the same idea in the findings of their study on how the community shared business model can be achieved in South Africa's energy transition. A participant also mentioned that government initiated the Renewable Energy Independent Power Producers Procurement Programme (REI4P) that gave more opportunities to various power utilities, including municipalities and Eskom, to allow them to drive this initiative. Winkler, Keen and Marquard's (2020) report supports the views of the participant as they explains that the REI4P, widely regarded as a success in South Africa, is a competitive tender process launched to facilitate private sector investment into grid-connected renewable energy generation.

According to the participants, small-scale embedded generators do not require licenses but need to be registered with Eskom and customers must acquire a registration and CoC and notify NERSA. Bhattacharyya and Palit (2021) and van Schalkwyk and Scholtz (2024) reiterate that these measures must be adhered to in order to legitimise customers' small-scale renewable energy systems. Oliver (2021) stated that the President amended Schedule 2 of the Electricity Regulation Act aimed to exempt generation projects of up to 100MW from a requirement to acquire a license from NERSA, regardless of whether they are grid-tied or off-grid. The participants indicated that the registration is required to enforce compliance and to ensure safety of the installation, which is confirmed with a system generated EGI report from a compliance engineer. Adams, Abed and Lochner (2023) explain Electricity Grid Infrastructure Strategic Environmental Assessment (EGI SEA) as an enabler for transmission and distribution streamlined and integrated environmental authorisations for infrastructure projects in strategic key areas for grid development.

In other matters pertaining to the implementation of the SSEG programme in Eskom, the participants indicated that there is an intention to extend the programmes to residential customers by installing PV rooftops and solar geysers. The general view of the participants is that there is a need for policies to deal with the risks involved and define the incentives for the customers. Participants also indicated the need for stakeholder engagement with parties such as the government, private sector, and the customers to decide on issues like technology adoption for this project. This current research on technology gives insight into other technologies that have not been fully exploited to support the implementation of small-scale renewable energy, like blockchain. It is also acknowledged by the participants that banks now finance the installation of renewable energy sources. Shahbaz, Topcu, Sarıgül and Vo (2021) stated that improved financial systems in a country reduce the costs of investing in renewable energy projects and encourage using environmentally friendly energy sources. Amuakwa-Mensah and Näsström (2022) indicated that the

trend of declining cost of renewable energy technology and energy storage systems, together with reforms and subsidies are vital instruments to promote investments in renewable energy to increase renewable energy generated electricity. They further stated that policies and other support structures are also important to minimise the risk and confirm returns to secure the available financial support for the developers. The IRP of 2023 is one such policy document meant to support electricity reform and transition in South Africa. This confirms the participants' view that policies are required to inform decisions that must be made in respect of extending SSEG programmes to residential customers.

5.2.3 Theme: Process description and stakeholders involved

The participants explained the process of registering a small-scale renewable energy system as beginning when a customer calls to apply at Eskom. A Customer Services Advisor, together with the design engineer, visits the customer's premises to gather information on the possible capacity to be connected or fed back to the network grid. Once designs and metering are ready, execution of the project begins.

According to the participants, the stakeholders involved in the small-scale renewable energy market are: the government and its partners such as DMRE, Department of Cooperative Governance and Traditional Affairs and SALGA that look at the national energy policies; NERSA, the body that regulates the energy sector; the South African National Energy Development Institute which promotes energy efficiency and the adoption of renewable energy; Eskom and the municipalities as the distributors; the developers who plan, design and install renewable energy plants; the manufacturers who are currently mainly international (China); the banks that provide the financial support to the developers and manufacturers; and finally the customer. The review of South Africa's energy policy, Just Energy Transition (JET) policy and carbon pricing and climate mitigation policy confirmed that these are indeed the stakeholders involved. The literature reviewed in the study also aligns with the views provided by the participants regarding the stakeholders involved in renewable energy generation. Ibrahim et al. (2021) and Bekun (2024) maintain that these dedicated stakeholders can ensure sustainable energy supplies, adopt green growth policies and drive the transition to cleaner energy.

Sovacool (2021) concurred in his research that the stakeholders in the renewable energy market in South Africa and other African countries are energy consumers, local inhabitants and communities, energy companies, governmental institutions and bodies, IPPs, private business developers in the energy sector, and financing institutions. Ibrahim et al. (2021) included labour unions among other stakeholders. The participants in the study added that the customer's role is to initiate the process to legalise the installation and to bank or store their energy with Eskom to support the grid when the demand is high and supply is low. The findings of studies such as those conducted by Sayed et al. (2023) and Tan et al. (2021) support

the participants' feedback that excessive energy produced by renewable energy sources can be stored for later use in the grid or by customers. Tan et al. (2021) noted that stored energy will form part of the main electricity source in future.

5.2.4 Theme: Eskom's reasons to venture into the small-scale renewable energy market

The participants stated that there are several reasons that would drive Eskom to participate in the small-scale renewable energy market. These are discussed in the following sections according to the sub-themes identified in the study.

5.2.4.1 Statutory reasons for Eskom to participate in small-scale renewable energy market

It was mentioned by a participant that Eskom cannot be 'uninvolved' in the process of providing grid access to the generators that qualify. Energypedia (2015) also supports this statement, as they stated that it is a government decision to make Eskom an important stakeholder of the energy transition by upholding Eskom as the renewable energy purchasing agency with a single buyer office that will buy electricity from qualifying renewable energy generators. Motjoadi et al. (2020) indicated that it is a human right for every South African citizen, including rural households, guaranteed by governmental laws and policies, to have access to electricity, though it remains expensive to reach many remote isolated rural areas through the central grid extension. They further stated that this can be resolved by incorporating energy storage systems, distributed generators, and localised loads from independent distributors. This qualifies the participant's statement of Eskom being unable to be 'uninvolved' in the process. It was also alluded by the participant that the SSEG programme fits into the SDGs to which South Africa has committed. There is literature that provides insight into the SDGs and the countries that are participating in the drive to achieve the goals, of which South Africa forms part. Adenle (2020) indicated that renewable energy sources have a significant role in the implementation of the SDG 2030 agenda to further reduce poverty and address other challenges in African countries including South Africa. Half of the participants noted the commitment by South Africa to reduce its carbon footprint when the country signed the Paris Agreement which supports the JET initiative and further encourages opportunities for international financial support. According to Van Soest, den Elzen and van Vuuren (2021) there are over one hundred governments including South Africa that are part of the Paris Agreement committed to achieving net-zero targets to reduce GHGs and neutralise carbon.

5.2.4.2 Performance and efficiency reasons for Eskom to participate in small-scale renewable energy market

Sixty-five percent of the participants indicated that the introduction of renewable energy sources will reduce generation and transmission energy losses and subsequently reduce load shedding. The participants further indicated that load shedding upsets the customer, leads to revenue loss and damages corporate image as

customers associate their loss and the drop in the country's economy with Eskom. Naidoo (2023) concurred with this view and argued that one of the solutions to stop load shedding is to use alternative energy sources such as renewable energy. According to the participants in the current study, renewable energy sources enhance grid resilience and reduce outage vulnerability. The participants indicated that if Eskom would build micro-grids in the remote areas through SSEGs and if more customers would generate energy and sell or bank it with Eskom, generation capacity will improve, and Eskom will save on building new infrastructure and grid expansion. Motjoadi et al. (2020) stated that grid extension alone is not a sustainable solution to provide electricity to rural communities. The installation of microgrids was deemed earlier as a preferred option that Eskom is already installing in villages that are isolated like Swartkopdam and a few others, where the grid is far from these villages. They indicated that microgrid, though not widely used, is a viable solution to provide the country's required energy, supported by suitable policy framework.

5.2.4.3 Adaptation to change reasons for Eskom to participate in small-scale renewable energy market

According to Eberhard (2018), the electricity sector is no longer a monopoly as there are now multiple energy generators in the market and customers can choose their preferred source of supply. The participants stated that Eskom needs to continuously develop as there are other players in the market who are in competition with the entity. This was supported by the studies of Buraimoh, Adebiyi, Ayamolowo and Davidson (2020) and Baker (2021b) as they stated that the introduction of IPPs in the South African electricity industry has changed the energy landscape of the country for the provision of sufficient energy and lower electricity prices. The participants stated that Eskom needs to keep up with the technologies that are suitable for customers that want cleaner energy. The participants further stated that Eskom needs to find other income streams as some of the customers have moved their businesses to renewable energy generators, therefore Eskom must tap into these renewable energy technologies to remain in the market. Akinbami et al. (2021) maintain that renewable energy is the future of electricity supply although the current hindrance is to do with the capital cost required for renewable energy equipment and the government bureaucracies in the country that hinder the process for customers. The participants stated that tapping into the renewable energy market is an opportunity for Eskom Distribution to purchase electricity at a lower cost and sell at a profit.

5.2.4.4 Pricing and revenue reasons for Eskom to participate in small-scale renewable energy market

Eskom needs improve its revenue generation while ensuring that the price is still fair to the customer. The participants stated that if customers are unable to use banked or stored energy from their cheaper and clean

PV plants in standard time, they can sell it to Eskom at lower price, which will in turn also bring electricity price down. There is not enough scholarly literature regarding the banking of electricity but there are reference websites that are available such as PV Consult's (2024) site that explains that excess energy banked month-to-month can be offset back to Eskom by the customer. The participants indicated that this would help Eskom to avoid the use of expensive OCGT (diesel fuel). They further stated that SSEGs opened another business opportunity and revenue stream for Eskom and has created jobs within the renewable energy sector which will improve the economic growth of the country. The process of searching for the possible SSEGs off-grid or grid-tied is important, as mentioned by participants, as it assists in managing privately owned SSEGs who can export their energy into the grid and it eliminates illegal connections to recognise revenue.

5.3 Objective: To identify the benefits of the small-scale renewable energy market for Eskom Distribution

The discussion in this section relates to the second objective of the research which seeks to identify the benefits for Eskom Distribution in participating in the small-scale renewable energy market. The following discussion is aligned to the themes that emerged from the responses of the participants during the interviews.

5.3.1 Theme: Eskom benefits from participating in the small-scale renewable energy market

The following sub-theme discussion is related to the first interview question that was posed to participants to address the second objective of the research regarding the benefits for Eskom from participating in the small-scale renewable energy market.

5.3.1.1 Energy security

The DMRE (2021b) suggested that rising power outages in South Africa gave rise to the installation of small-scale renewable energy. It further stated government's support to grow and increase renewable energy sources was formalised through the IRP. In terms of the participants' views, load shedding can be reduced by reducing load, which eliminates the risk of large-scale outages as there is currently a dependency on the Eskom generators. Toro-Mendoza et al. (2023) stated that the integration of renewable energy into the power system has given the system flexibility in operating the conventional generators, which helps them perform better as the load is shared between the systems. According to Bakht et al. (2021), researchers call the energy mix a hybrid energy system. The participants indicated that micro-grids would help pick up lost

loads from the current generation units should they fail, minimising the effect to the grid availability of supply.

They further stated that small-scale generators create a virtual power station for Eskom which can be used to capacitate the current grid to improve the reliability and security of electricity supply to customers and further reduce strain on the generation and the transmission systems as they cover part of the demand with additional power into the system. This statement from the participants is supported by Mahmud et al. (2020) as they indicated that the future smart grid or the IoE will enable all prosumers to coordinate with each other and form VPPs. Onaolapo, Carpanen, Dorrell and Ojo (2021) also stated that micro-grid systems operations, which is one of the VPPs, reduce emissions, improve reliability of supply, and balance the supply and demand of energy through renewable energy sources.

5.3.1.2 Customer retention and market share growth

The views of the participants were that Eskom can retain and acquire new customers if they increase customer participation in Eskom power generation. This, according to the participants, will assist in reducing the numbers of customers that disconnect from the grid and operate independently. Though the participants' view is supported by numerous university researchers in South Africa, these researchers also mention that the Gini coefficient, which is the method to measure income inequality in the country, slows down the transition to renewable energy from lower classes of societies (Mukhopadhyay & Sengupta, 2021; Sonday, 2021). There is an increase in customers that want cleaner energy sources, according to the participants, and Eskom must find a way to retain them and be able to compete with the IPPs. Terrapon-Pfaff et al. (2014) supported this view as they stated that the customers in the rural areas are looking for cleaner energy that is affordable and better than the costly traditional form of electricity generated from fossil sources. The views of the participants were that Eskom must take part in the operations of the small-scale generators to maintain control of power generation. They further indicated that Eskom must drive customer engagement and satisfaction by providing improved solutions that are much more reliable than the current power stations.

5.3.1.3 Revenue and balance sheet elements

Small-scale renewable energy presents opportunities of new revenue streams from diversified grid services to Eskom, as cited by the participants. The participants stated that the small-scale renewable energy allows for significant savings such as reduced power plant operational and maintenance expenses. The participants' views were that when Eskom buys energy cheaper from the SSEGs, it can pass the savings on to its customers, and the ability for Eskom distribution to connect embedded generation on the distribution networks can keep electricity prices lower. The participants views are supported by Lovins (2020), who

stated that electricity produced closer to the customer is cheaper than that from the central power station due to distance. The participants' views are also congruent with those of Falchetta, Michoud, Hafner and Rother (2022: 2) who stated that the main challenge is implementation of business and finance models that are "profitable for private decentralised electricity system providers, economically acceptable for the rural and poor, as well as attractive for return-seeking investors". The participants stated that a Robin Hood effect can be considered which means those who can afford a small-scale generator will benefit, and costs such as the middleman can be cut out for the majority who cannot afford it so that they benefit. The idea, according to the participants, is to save in capital for increased power generation and purchase.

5.3.1.4 Organisational and operational matters and global trends

Like modernisation in the grid management and the rise of battery energy storage solutions, the participants stated that this shift to renewable energy drives innovation. Numerous studies support this statement. Elia, Kamidelivand, Rogan and Gallachóir (2021) and Zheng, Yang and Yu (2021) stated that the reductions in energy technology cost can be awarded to various innovation trends in the energy system and technological innovation has in history been and continues to be critical for renewable energy development. The participants stated that workforce will be trained to be able to work with the renewable energy sector and to equip them to deal with new trends in the market. According to the participants, the small-scale renewable energy sector is growing, and it presents Eskom with an opportunity to expand or broaden its business into other spheres of engineering, with transmission and distribution being responsible for integrating the SSEGs. The participants further stated that renewable energy sources are spread out wide and far, and Eskom can best harvest this source by engaging small-scale generators.

Looking at the global markets, the participants indicated that participating in renewable energy will help Eskom to engage in net-zero emission strategies, as indicated in the Just Energy Transition Implementation Plan, and also provides the benefit of having a more robust and resilient power system due to this extra in-feed of energy into the grid. They say Eskom will play its part in terms of implementing the green energy policy as society is moving towards cleaner energy generation and less dependence on burning coal or other fossil fuels. The views of the participants are congruent to the findings of previous studies conducted by Allen et al. (2022) and Van Soest et al. (2021) on South Africa's participation in the net-zero Paris Agreement, which includes more than one hundred countries. These studies examined the benefits of reduction of carbon emissions in the country while attracting more investments through the introduction of renewable forms of energy generation. In future, the participants believed that Eskom, currently the largest emitter of carbon in the continent, would have an advantage of not paying carbon taxes that come with polluting energy sources, as the carbon footprint from energy generation will be reduced. The participants

indicated that a mixed energy system has been implemented in various countries and Eskom is following the trend with two successful BESS installations in KZN.

5.3.1.5 Grid management and reach

Participating in the small-scale renewable energy market allows Eskom to monitor and guarantee safety in the power generation and distribution sector, as highlighted by the participants, to make sure that the energy is clean and safe for customers to use and for technicians to work on. Van Schalkwyk and Scholtz (2024) suggested that legalising the installations ensures safety for customers and Eskom employees when they are operating the network. The participants further stated that there are areas where the network is constrained with no conventional energy available, where the BESS can be used for these remote customers. The participants' views are in line with a study by Akinbami et al. (2021) who found that the rising energy demand in South Africa has overwhelmed the conventional power generating plants and the country is developing its renewable energy sector that is predominantly in poor and rural areas of the country that are not connected to the national electricity grid.

5.3.2 Theme: Stakeholders' benefit in the small-scale renewable energy market

This question related to the second objective of the study and was aimed at understanding what the stakeholders will gain from participating in the small-scale renewable energy market. The discussion below examines the findings in this regard that emanated from the participants during the interviews.

5.3.2.1 Benefits for Eskom

The response from the participants to the second question of the second objective started with looking at Eskom where they indicated that Eskom would gain from the savings accrued due to network expansion capital and increased profit from the additional energy available to deal with loadshedding, which is important to the economy of the country. The participants indicated that Eskom gets to take part in clean energy generation which will reduce its carbon footprint. Bhattacharyya and Palit (2021) and Ayodele, Mosetlhe, Yusuff and Ogunjuyigbe (2021) are amongst the many researchers who have conducted research related to network grid expansion and implementing renewable energy to ensure universal access to electricity. These studies found that for Africa and Sub-Saharan Africa, the expansion of central grid is effective for urban areas and 30% of non-electrified rural areas, and for the 70% remaining, decentralised solutions such as renewable energy with micro or mini-grids and standalone solutions are a suitable solution.

Eskom will, according to the participants, have reduced demand for electricity and this leads to better grid safety as outages present many risk such as communities' exposure to unsafe situations. The participants

stated that Eskom has an opportunity to ensure safe connections and properly installed equipment in all electricity generation facilities and equipment when it takes part in the renewable energy market.

According to the participants, Eskom can have better control on DSM during peaks when it incentivises customers to reduce energy demand, such as SSEG customers with battery storage systems who can stay out of the peaks and reduce the need to run expensive diesel generators. The findings of a study by Dippenaar, Merven, Euston-Brown and Borchers (n.d.) were similar to the participants' view as they found that when SSEG generation matches with the peak demand, it reduces the customer's peak demand, and when the peak demand is permanently reduced, the utility (Eskom) reduces capacity costs as asset life extends and network investments requirements are deferred. Sørdalen (2022) called this exercise 'peak-shaving' and defined it as the reduction of peak consumption of power from the electricity utility (in this case, Eskom) using alternative sources of energy such as BESS and renewable energy sources, thereby reducing utility tariff costs. The participants stated that the disadvantage of SSEG battery storage systems is that some SSEGs might need to charge their batteries from the grid thereby creating a new peak.

The participants believed that Eskom could advance in adopting and implementing modern technologies and acquire new skills for engineers and technicians to meet the requirements of new technologies, making the organisation a world class company with world class employees. There are still opportunities for Eskom to embark on and fully benefit from the renewable energy sources and participate in all spheres of technologies related to renewable energy.

5.3.2.2 Benefits for the small-scale renewable energy customers

One of the stakeholders of the renewable energy market is the customer. The participants stated that any SSEG customer (household, public or private facility) can bank their excess energy for later use. This is supported by research conducted by Löser and Bekker (2022) that indicated that stored energy from SSEGs can solve several of South Africa's energy constraints such as arbitrage, which is the energy time shifting, deferred line upgrades, demand smoothing and voltage and frequency regulation. The participants further stated that customers can use Eskom network as a cheap battery to store their energy and avoid buying expensive batteries. This would allow them to have continuous electricity supply but they would need to use their banked energy within the agreed time which is within a period of a month. This enhances stability and energy security (reliable supply). This view from the participants is supported by the literature reviewed by Kekana (2020) as he cited that hybrid renewable energy is much more stable and provides continuous energy supply though fossil energy sources are still used as a base load.

According to the participants, the SSEG customers would pay low electricity bills, have energy independence, and be able to escape loadshedding while generating revenue. African Energy (2021)

affirmed that the customers that are connected to the Eskom grid are still considered for a low energy bill when using more renewable energy through a renewable energy tariff that was piloted by Eskom, although it has not been implemented yet. The view from some of the participants was that the consumers have freedom to choose their source of electricity as they can buy energy from the SSEGs at even cheaper rates. Mulaudzi et al. (2021) in their research noted that SSEG brings about opportunities for customers to sell excess power to the utilities, inspires local economic development, creates jobs and reduces carbon emissions, thereby combating climate change, and further provides security of supply which is part of JET.

One of important benefits of taking part in the Eskom SSEG project that the participants mentioned is that customers who legalise and register their installation with Eskom will have their installations checked for safety, which will be guaranteed through official reports such as EGI reports, engineering reports and the issuing of a CoC. This view of the participants is supported by Viljoen and Dube (2023) who indicated that consumers must purchase SSEG installations with approved specifications by the South African Bureau of Standards, and their system must be installed by an approved professional registered with the South African Photovoltaic Industry Association in accordance with South African National Standards. Participants' views are also in line with the findings of a study by van Schalkwyk and Scholtz (2024) where they note that registration ultimately confirms that the installation is safe for the customer and for the technicians working on the installation.

5.3.2.3 Benefits for the government

In earlier discussion, it was mentioned that the government of South Africa committed the country in the Paris Agreement for net zero goals by reducing carbon emission, and therefore must ensure the achievement of this commitment through policies. The Government Gazette (2004) established a number of enabling activities to ensure that renewable energy is part of South Africa's energy portfolio to mitigate load shedding and carbon emissions as one aspect of addressing the energy-related challenges in the country. The participants indicated that when Eskom participates in the renewable energy market, the government will achieve policy goals related to renewable energy adoption, carbon footprint reduction and energy security. This view from the participants is in line with the arguments of Van Soest et al. (2021) and Marquard et al. (2023) who noted that South Africa's inspirational commitment of finally committing to a goal of net zero carbon emissions by 2050 in the Just Energy Transition Framework is geared towards achieving quality of life for all South Africans. This falls under Article 4.19 of the Paris Agreement in which President Ramaphosa stated that Eskom had committed to drive the implementation of net zero CO2 by 2050. This view from the study by Van Soest et al. (2021) further aligns with the participants' belief that another government benefit would be that the sector has the potential of growing as an industry, which subsequently increases job opportunities in the country.

Energy security is of national concern, as indicated by the participants, who they stated that if measures such as developing the renewable energy sector can help the situation as envisaged, it is welcomed by the government. The participants mentioned that some companies have closed down in South Africa due to energy insecurity and the government needs to avoid capital flight from the country to ensure job security and eradication of poverty, thus SSEGs would be beneficial to aid the situation. There is vast literature regarding energy security which supports the views of the participants. Cergibozan (2022: 617) stated that "energy is one of the main sources of modern life and one of the drivers of economic growth". He further stated that renewable energy can be the solution to the problem that has been predicted that fossil fuels such as oil, gas, and coal would be completely diminished by 2090, which will threaten the energy security of many countries in the current energy regime.

The participants claimed that NERSA will also benefit with the small-scale renewable energy market implementation as they have more flexibility in terms of energy policies as a new source of energy that they regulate. In addition, because NERSA would gain a better perspective of how many customers have embedded generators and other electricity information, they can make informed decisions on processes, procedures, and policy formulation. Mulaudzi et al. (2021) stated that the NERSA's framework permits the SSEG systems installation to be for the customer's consumption and for the customers to sell excess power to the utilities, thereby stimulating local economic development and job creation.

5.3.2.4 Benefits for industrial, financial, and other sectors

The benefits of small-scale renewable energy, as indicated by the participants, is that manufacturers, support industries and suppliers of equipment will have businesses, and the private sector will see growth in consultancy, design, manufacturing, installation, and maintenance of renewable energy systems. Ibrahim et al. (2021) stated that the benefit of renewable energy which is realised when it is supported by the government, societies and private businesses to improve the economy, is that it attracts more investors, creates jobs and improves technology. Majid (2020) and Ram, Aghahosseini and Breyer (2020) also noted that there were 10.3 million jobs created in 2017 from the global renewable energy market, which realised a 5.3% improvement from 2016 as published by The International Renewable Energy Agency in 2018 (IRENA, 2018). They stated that many other opportunities in the socioeconomic space were created from renewable power, although employment is exceptionally centralised in many countries.

According to the participants, research and development will be more active should Eskom become more involved in the renewable energy market. Feldman et al. (2024) stated that as the technology matures and the market widens, renewable energy equipment eventually becomes more affordable. They also stated that the increase in production of solar PV technology in countries like India and China saw a drop in price of

PV equipment between 2022 and 2023. This confirms the view of the participants that Eskom's improved uptake of renewable energy will result in more research and development and reduced costs.

Other institutions that will benefit from the small-scale renewable energy market, according to the participants, are the financial institutions that stand to benefit by financing these renewable energy projects and the municipalities that are going to gain by being part of the trading as they will get quotas and can access extra energy from independent SSEGs. Mulaudzi et al. (2021) noted in their study that there has been a gradual increase in the number of SSEGs connected to the municipalities distribution network in South Africa where there are good opportunities for job creation that result in local economic growth.

5.4 Objective: To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution

In this last objective of the research, the challenges faced by Eskom in participating in the renewable energy market are examined. The following discussion expounds the responses from the participants as they define these challenges.

5.4.1 Theme: Bottlenecks for Eskom Distribution in venturing into the small-scale renewable energy market

The discussion of the first interview question related to the last objective of the research presented below is to do with the responses from the participants and their views of the anticipated bottlenecks for Eskom in venturing into the small-scale renewable energy market.

5.4.1.1 Network grid bottlenecks

The most frequently mentioned bottleneck by the participants in terms of this theme is the network capacity and coverage on MV lines where distance from the network control bar makes voltage control fluctuate as the Eskom distribution and transmission network is designed to supply load from generation instead of receiving load from generators. Baker (2017b) stated that Eskom transmission grid, which is built similarly to the distribution grid, is experiencing capacity challenges and that Eskom therefore needs to upgrade the networks to enable renewable energies to connect to the grid. Mahmud et al. (2020) also noted that energy storage devices require a bidirectional power system. Mulaudzi et al. (2021) highlighted that unregistered SSEGs reduced the ability of the municipality to manage the quality and stability of the grid. Oloo, Molefyane and Rampokanyo (2021) suggested that CSIR tests on the grid to determine its readiness to accommodate SSEG take into consideration load flow studies on the networks that have stable voltages as well as capacity to accommodate bi-directional flow of electricity in the grid. The participants stated that Eskom did not have any forward planning in terms of expanding the networks prior to the new SSEG

programme, hence the network is unable to evacuate the new energy as it was built for small load, and it might take time and money for infrastructure upgrades and the adoption of new technology.

The participants indicated that there are increasing numbers of SSEGs that are applying for access whereby the PV plants in remote areas require large sums of infrastructural finance. Oliver (2020) indicated that there are many illegal connections and non-compliance by the users due to the expensive connection costs. In the current state of the network, the participants stated that Eskom might not be able to purchase the energy generated by the SSEGs as there are specific networks in Eskom distribution that can uptake the SSEG power, whereby for LV systems an export of 75% and for MV systems up to 100% are allowed. There are other options of energy trading that can be beneficial for the end goal of reducing carbon, reducing outages, and generating more profit for Eskom instead of investing in costly infrastructure. Dippenaar et al. (n.d.) indicated that transmitting power to load centres requires infrastructure developments, and SSEGs can be installed in load centres to avoid this cost. Crespo-Vazquez, AlSkaif, Gonzalez-Rueda and Gibescu (2020) stated that the number of prosumers in the market presents opportunities for different stakeholders in the distribution network, which is supported by self-consumption policies to enable them to sell their energy back to the Eskom grid at an agreed price such as Feed-In-Tariffs (FiTs) and net-metering. They further stated that coordinating prosumers at community level to trade energy amongst themselves is a more recent approach proving that new market designs such as Local Electricity Markets that are centred around the end user to provide a suite of choices and privacy can be implemented.

5.4.1.2 Legal requirements

Dippenaar and Bekker (2024) stated that technology is governed by law to improve compliance. The participants indicated that there are many costly legal requirements that need to be adhered to before customers are connected or are able to export energy into the Eskom networks. Van Schalkwyk and Scholtz (2024) listed the process milestones, which include initial fees and test reports for the installation verification for safety and compliance. Saad (2021) also stated that there is a required CoC for net electricity metering used for prosumer exporting agreements that must be signed by a professional engineer, costing up to R15000. Customers are required to obtain an Electricity Outage Cost (EOC) used for reliability planning and renewable energy pricing, therefore the participants suggested that a tax incentive from the government would be a suitable support for the procurement of equipment. The literature shows that America is the driver of this costing mechanism and there is not a great deal of literature on this topic relating to other countries including South Africa. Woo et al. (2024) stated that adopting America's lower EOC presents policy implications such as reduced electric grid optimal planning reserve that helps in improving the efficiency of grid cost.

There are documents that customers are expected to submit to NERSA and the participants indicated that Eskom must make sure that customers understand what is needed within the stipulated timelines, which sometimes requires the customer to hire consultant support to comply. However, the participants stated that there is lack of clear regulations from NERSA regarding SSEG. Mulaudzi et al. (2021) stated in their study that the NERSA 2018 document outlined the procedure for registering the SSEG and formulated the guidelines that must be used to register generation facilities with a capacity of 1MW or less (SSEG), and also established processes and procedures that must be followed when registering a SSEG. This confirms that there are written regulations, processes and procedures that must be shared amongst the stakeholders to clarify the process that seemed unclear, including the possible regulatory restrictions for Eskom to participate in the customer registration process.

5.4.1.3 Cost to customer

There is great investment that customers put aside to purchase the renewable energy technology related to SSEG. Mulaudzi et al. (2021) stated that it is a costly exercise to acquire the registration for a SSEG plant. The participants indicated that customers invest between R200 000 to R500 000 to set up their SSEGs and are further required to register their installation and acquire an EGI report costing between R10 000 to R20 000 which goes to the Department of Employment and Labour registered Approved Inspection Authority. A South African Photovoltaic Industry Association PV GreenCard endorsed installer must also approve the installation (SSEG, 2018; Wiley & Bick, 2018).

When the customer meter is changed from one tariff system to the time-of-use tariff, participants stated that Eskom charges customers a tariff conversion fee of about R4000 or R5000, which they do not appreciate. These costs make compliance difficult for customers who may not have the funds to adhere to the registration requirements. The Eskom fact sheet outlines the registration process which includes the required tariff changes in order for the customer to plan for the costs of registering their systems (Eskom, 2021).

5.4.1.4 Eskom structure and management

Eskom traditionally had a vertically integrated management system with many rules and structures that the participants viewed as requiring a change management process to deal with integrating the new renewable energy market. The participants indicated that at times there is role confusion between critical stakeholders, which results in illegal customers that are connecting themselves without following proper regulatory steps. To address this issue, SSEG (2018) and Eskom (2021) have provided clarity and a shorter easy-to-use guide for customers and prosumers.

The participants were concerned that Eskom's interaction with the customer ends at the meter and does not extend beyond the meter. They viewed this as a lost opportunity of more revenue stream as competitors extend their operations beyond the meter and take advantage of that market share. They further indicated that in countries like Australia, the electricity company quotes and installs SSEG's on the customer roof, therefore they have full control of the installation. According to the participants, Eskom can upskill the technicians that will work with the SSEG market beyond the meter on the renewable energy generation to tap into the whole market. Blakers, Lu and Stocks (2017) and Heidari et al. (2020) stated that Australia presently uses different sources of renewable energy and further manages energy demand as far as monitoring the type of load that the prosumers and customers connect to the grid, whether grid-tied or off-grid. This confirms the country's involvement in beyond-the-meter activities.

Eskom was viewed by the participants as being slow in adopting the technology which has existed commercially since the 1980's and was thought to have fallen behind in the knowledge of the system and its operations. Ting and Byrne (2020) and Richards (2023) stated that Eskom was viewed to be regime resistant as it was not participating in the renewable energy market The participants also indicated that Eskom's billing system is not yet ready for this technology, therefore there is a great deal of manual intervention that is required in the implementation process in the absence of the required technology. Akinbami et al. (2021) stated that South Africa continued to emphasise the use of fossil fuels even when the country was aware of the social and economic benefit that renewable energy sources allow for and therefore took quite long to introduce the renewable energy technologies. There are many other researchers that even label Eskom as regime-resistant incumbent when it comes to the implementation of renewable energy technologies (Richards, 2023; Ting & Byrne, 2020).

The participants indicated that Eskom Distribution will act as a middleman, which it is not used to, in the process of supplying power to the ordinary customer from the SSEGs and is expected to make money out of this while ensuring that the customer is satisfactorily served. Oliver (2021) highlighted that the renewable energy implementation process is stipulated in the Electricity Regulation Act 2006 and involves tariff structure, registration, and licencing of renewable energy installations. In the views of the participants, Eskom is too large and engages in extensive discussions, deliberations, and approvals before deciding to install any PV in any location and sometimes there is no proper coordination of all departments involved in decision-making and implementation. They stated that the private sector moves faster than Eskom, as Eskom's timelines for projects can be as protracted as two years.

They further stated that Eskom is still disjointed, erratic and inconsistent in the approach to bring on all the energy generators that are applying. Participants noted that Eskom always tends to pay more for what others

are installing for less and there is therefore a need to review the internal tendering and bidding system. The literature supports the view of the participants in general, such as a study by Jonathan, Mafini and Bhadury (2020) who found that Eskom tends to acquire supply chain risks due to its procurement process.

5.4.1.5 Equipment and supply

It was noted by the participants that reliability of supply from renewable energy generators is not guaranteed, which limits Eskom's planning capabilities. Findings of an extensive literature review conducted by Ibrahim et al. (2021) concurred with the participants views as they indicated that a single-source renewable energy system cannot be viewed as reliable, especially for off-grid loads in rural and remote areas. The participants also stated that there are shortages of smart meters as they are required globally, and supplies are not always available. At times, the participants indicated that the customer network connection is delayed by the absence of materials such as smart meters after installation registration is complete. Rae, Kerr and Maroto-Valer (2020) claimed that the implementation of smart technologies around the world faces delays, for example due to the unavailability of these technologies such as smart meters, and they noted the delayed implementation of smart meters in the United Kingdom. According to the participants, some customers resort to substandard installation in the absence of materials which upon inspection are found not to meet minimum requirements.

The participants also stated that not all structures (roofs) are suitable for PV installations as sometimes the engineers must convince customers to get the right type of roof first before they can start the processes of getting into the market. Participants further mentioned that installations need to be protected from theft, and this is an extra cost in acquiring the system.

5.4.1.6 Shortage of skilled manpower

In acknowledging the delayed implementation of small-scale renewable energy or SSEG, the participants indicated that there is limited skilled manpower and technical expertise to manage and maintain decentralised energy systems effectively. They further suggested that it is not always easy to get technicians who are registered with the Engineering Council of South Africa (ECSA) as required in the registration process for small-scale renewable energy installations. The participants stated that there is still a need for manpower training so that technicians acquire knowledge of the renewable energy market as well as government regulations as decision making and government approval is always sought in the operations.

5.4.1.7 Marketing and customer handling

The participants stated that there is limited consumer awareness and understanding of the benefits and opportunities that arise with selling energy to the grid. They further indicated that there is a need for proper

marketing to ensure that Eskom engages all relevant stakeholders to reduce customers that are taken by IPPs which reduces Eskom's customer base. Meyer and Overen (2021) suggested that there is a need for a concentrated approach to educate existing and potential consumers regarding the benefits of participating in the small-scale renewable energy market in a nationwide drive. These benefits may include not being affected by load shedding and taking control of their electricity demand management.

5.4.1.8 Policy and non-standard approval systems

The small-scale renewable energy market is experiencing misalignment in state policies, barriers to investment in the renewable energy sector, and lack of political commitment as mentioned by the participants. Lawrence (2020) stated that the rollout of renewable energy was delayed further by the irregularities in the fossil generated electricity and 'austerity-driven' implementation policies. According to some participants, recent debates in the country supported the view that the government must fully fund this sector while other participants are of the view that the country is not ready for the technology due to lack of clear regulations and political commitment, which also affects Eskom's drive in renewable energy. The participants further indicated that the approval and installation processes take very long and if the customer also lacks funds this may draw out these processes up to twelve months or longer. The literature available supports this view of the participants. For example, Akinbami et al. (2021) and Mutezo and Mulopo (2021) stated in their research that the government can provide more financial support and incentives to investors and customers to increase the renewable energy technology implementation in South Africa and to realise the full potential of the industry. The participants maintained that there is a need to simplify and standardise the approval process across all local authorities.

5.4.2 Theme: Possible improvements to the rollout of the small-scale renewable energy initiative

In the responses collected from the participants, the improvements that can be made in the rollout of small-scale renewable energy will be discussed in the sections to follow.

5.4.2.1 Improvement of customer participation

The participants estimated that it is only about one percent of the possible customers that are connected to Eskom network that have registered their small-scale renewable energy installations; therefore, Eskom needs to register more customers. Viljoen and Dube (2023) confirmed in their study that Eskom grid-tied SSEG customers must meet all necessary requirements for NERSA licence registration. The participants stated that many potential customers are uncertain about what process must be followed and what Eskom will charge them, therefore it is essential to educate and market to the consumers the benefits and opportunities in this renewable energy space and to foster partnerships with private sector companies.

SSEG (2018) and Eskom (2021) provided clarity and a shorter, easy-to-use guide for customers and prosumers to follow when registering.

It is Eskom's duty, as indicated by the participants, to encourage customers to participate by offering good payment rates for the energy they export into the network and to offer incentives for customers to join. Hlebela (2021) also recommended in his study that the regulatory process must be streamlined and there must be incentives such as the tax and Feed-in-Tariff incentives from the government that Eskom can implement. Eskom also needs to improve communication with the customers, as suggested by the participants, and must ensure that the correct documentation that is required is sent to customers on time. This, according to the participants, will rebuild trust with the customers and reframe Eskom's narrative and rebranding to the customers, and will contribute to enforcing the customers' willingness to participate.

The participants suggested that information must be shared through conferences where various stakeholders convene and various customers also attend, through publications audiences, and through information being sent to ECSA or The PV Association of South Africa for illegal customers to come forward to legalise their connection without penalties.

5.4.2.2 Customer costs reduction strategies

Participants proposed that Eskom should reduce initiation costs to the customers by reconsidering meter fees, deposits and connection fees, and also suggested that financial institutions should be encouraged to fund customers so that the registration process is shortened. This view of the participants has been discussed and in Section 5.4.2.1 above and is also recommended by Phiri (2022) who suggested fixed charges for SSEGs during the registration process. The participants also highlighted that Eskom is missing an opportunity as the skills to do most of the work already exist in the entity, as consultants are engaged in this type of work and therefore third-party costs for the customers can be reduced. The participants suggested that Eskom should consider providing a full-service suite to the customer that includes installation, and both parties would benefit on savings and on additional revenue stream. This suggestion by the participants was outlined in the discussion in Section 5.4.1.4 above. It is emphasised herein as relevant to the customer cost reduction strategy that needs to be implemented by Eskom.

5.4.2.3 Network upgrade and expansion

The participants indicated that expanding and upgrading the networks will allow specific targets for export capacity (e.g. 3000 MW of evacuation in a certain area) to be met and may encourage the bigger customers to legalise their connections. They further stated there is a need for Eskom to revise and adjust the long-term network plans, including network control centre, as investing in grid modernisation and smart

technologies will facilitate the integration of small-scale renewable energy systems into the grid. Molefyane, Mbatha and Rampokanyo (n.d.), in their paper presented at AMEU (Association of Municipal Electricity Utilities), indicated that there is a planning process tool called the 'feeder hosting capacity analysis tool' with which the network is analysed for possibilities to enable SSEGs to connect to the grid in its current state and further define future network upgrade plans. They further stated that control system upgrades, including other mitigation measures and network strengthening, are required for safe integration of the generation capacity beyond the network capability.

5.4.2.4 Manpower training strategies

The participants suggested that Eskom re-evaluates its education level system where there are electricians with single phase and three phase training but no training on DC systems. They further proposed that DC training be included in colleges. The participants stated that the country's education system be geared towards training people and equipping them with the skills required for these new renewable energy technologies. Mutereko, Shava, Musazura, Ndebele and Odindo (n.d.), in their paper written for LGSETA (Local Government Sector Education and Training Authority) on renewable energy, stated that investing in technical training for capacity building among employees and youth has been identified as a strategy to eliminate skill shortages in the utilities According to the participants in this study, Eskom must employ and quickly train competent staff to support the initiative to promote the registration of customers.

The participants stated that engineers and technicians must be registered with ECSA so that they are competent to sign the technical evaluations for the customer installations and government can help in producing a funding model to assist in capacity building within distribution. This requirement of a registered professional engineer was confirmed in an earlier study where Viljoen and Dube (2023) indicated that the EGI reports must be signed by a registered professional engineer. The participants indicated that there is a need to have contracts for training programmes and training manuals for the initiative.

5.4.2.5 Legal and procedural matters

The participants proposed that all stakeholders must be involved in the improvement of regulations and that the process from NERSA must be simplified so that an ordinary customer can understand it. The participants indicated that the connection process is cumbersome and discourages customers. They stated that Eskom and NERSA must partner in making the process simpler and educate the customer to avoid customer exploitation in paying for freely available information from NERSA. The participants suggested that NERSA should consider updating the marketing websites with the most recent information about the whole process. The participants also believed that Eskom needs to simplify its regulatory controls and they expect NERSA to produce clear wiring regulations and make sure that they are clear on how to

accommodate renewable energy. The IPP policy prepared by USAID Southern Africa Trade Hub indicates that it is in the small-scale renewable energy policy where the fast-tracked registration and licencing process must be defined.

5.4.2.6 Strategic partnerships with industry and other stakeholders

The participants indicated the need to encourage financial and academic institutions to embark on research and development, which can drive innovation and run additional training programmes that are vital for sustainable growth and efficiency in the renewable energy market. This is evident in a paper written by Molefyane et al. (n.d.) from the Council for Scientific and Industrial Research South Africa as they reported on the innovative research relating to small-scale renewable energy impact assessment using tools such as DigSILENT Powerfactory for the analysis. Baker and Phillips (2019) indicated that in South Africa the distributed technologies growth will require new players, institutions, and a wider scope for integrated energy planning locally. This literature also aligns with the participants' views that the products need to be produced locally as the demand is high, in order to minimise delays due to shortages. Baker (2017b) noted that the renewable energy industry in South Africa is dominated by foreign countries due to tight financial requirements.

5.4.2.7 Policy level strategies

The participants indicated that a national policy framework and a funding model to incentivise households or small industries that want to take up SSEG, but cannot afford the technology, is required. This was discussed earlier in Section 5.4.2.1 and is supported in the literature, for example by Hlebela (2021) who suggest that government incentives to support the potential participants in the renewable energy market should be offered.

The participants stated that Eskom requires a dedicated department that includes research and development, designs and implementation for renewable energy, run by a dedicated team that focuses only on renewable energies to make sure that the process is quick. They stated that a dedicated department will afford Eskom engineers time to do research and development on equipment, processes, and the market. The participants suggested that Eskom Distribution should create structures to integrate the old and the new business to positively progress. Eskom Distribution (2024) indicated that SSEG is handled by Customer Services in the Distribution Division, which is responsible for other customer services provided by Eskom Distribution. This therefore means there is currently no dedicated department for SSEG.

5.4.3 Theme: Recommendations for accessibility to Eskom Distribution

In this section, a discussion of the views of the participants regarding the question related to recommendations they would propose to make for the small-scale renewable energy market to be more accessible to Eskom will be conducted.

5.4.3.1 Initiation costs, funding, and energy price

The participants emphasised that Eskom should reduce initial costs, meter replacement costs, the deposit to convert to another tariff, and the pricey capital investment. The participants stated that Eskom Distribution must find affordable ways to get Pr. Engineering sign-offs for the customer EGI reports required for installation registration and suggested that Eskom that can perform the valuation, inspection and sign off of the reports. They stated that the residential sector in South Africa comprises middle-class customers who are most fragile and most sensitive to prices. According to the participants, the customers that would generate energy back to the grid must be offered attractive prices or incentives at set-up for their generated energy for them to willingly sell to Eskom. They further suggested that Eskom must consider paying customers for energy exported to the grid at a cheaper price rather than banking it.

5.4.3.2 Marketing of small-scale renewable energy sources in Eskom Distribution

A proposal from the participants is that Eskom should develop a web-based application that can provide the customer with all the information regarding the project. The participants further suggested that Eskom talks to the customers and advertises the benefits for them when they connect to Eskom distribution.

There is a need, according to the participants, to capacitate the marketing and customer acquisition department as they are in contact with the customers and must therefore be provided with all information and be reskilled to improve their customer engagement capabilities in promoting the renewable energy market in Eskom. It was further recommended by the participants that Eskom should make all 46,000 Eskom employees ‘guardian’ ambassadors for the small-scale renewable energy product. This will mean, according to the participants, that Eskom would be required to educate all its Eskom employees so that they pass the message to everyone they encounter.

There is an Eskom Distribution website that is dedicated to small-scale embedded generators to assist with information related to SSEG (Eskom Distribution, 2024). However, the participants further suggested that Eskom must develop different packages of SSEGs according to the customer profile, and design according to specific sites and areas to sell more of the product and gain more market share.

The participants stated that the Eskom-customer relationship needs to improve to change the customer’s view on Eskom while Eskom continues to lead in the renewable energy discussions of product security and

support available for the customer as they also venture into this market. The participants indicated that there is a need for a specialist department in Eskom to engage the customer and provide a clear view of their needs and to encourage them to sell their excess electricity to Eskom. Information dissemination to the customers, as indicated by participants, is important to inform them how they can easily access funding which will be a two-way communication between Eskom and customers. The participants indicated that there used to be a similar arrangement in the past in the form of AGRILEC and INDUSTRYLEC.

5.4.3.3 Registration processes and NERSA

In the earlier discussion of the findings presented above in this chapter, the participants indicated that the registration process is cumbersome therefore Eskom must simplify it without compromising quality, especially the legal part that still has present restrictions and tends to be expensive for the customer. A simplified process will encourage the customers to take part in the market instead of moving off-grid as the participants indicated, after they install their renewable energy plant.

The participants believe that NERSA should be encouraged to be in close partnership with Eskom during the transition to this market and technology, as there are currently no clear communication channels between Eskom and NERSA, yet the process requires approvals to go through NERSA offices. The absence of clear communication was identified by the participants as one of the reasons that delays the process for up to six months and they suggest that the Municipalities and Eskom should process the customer applications on behalf of NERSA to save the customer some waiting time during the registration period.

5.4.3.4 Technical support, research, and development

In acknowledging that renewable energy technology is still new in South Africa, the participants stated that customers need to be offered technical support and resources to help them and their businesses to adopt the renewable energy technologies. Given the availability of resources at Eskom, the participants suggested that Eskom should assist the customers to connect to Eskom's grid as the process is technical and they believed that this assistance would help the customers to avoid connecting to the network without following the necessary procedures.

Regarding research, the participants suggested that Eskom should work closely with learning institutions like universities to combine the Eskom engineers' experience with the institutions' academic research resources to develop new products. Currently, the participants stated, most of the equipment and technology is imported from abroad with limited local production. They further stated that considering the vast experience that Eskom has, products such as batteries or PPUs can be developed locally, which would allow South African households access to newer and cheaper technology, through engaging in the experiences of

other countries and what they have learned. The participants further alluded to the fact that South Africa needs to develop local products and supplies over time so that the country produces more renewable energy equipment with less capital investment. The literature confirms that the country uses a majority of imported materials for the renewable energy plants. Lema, Bhamidipati, Gregersen, Hansen and Kirchherr (2021) found that China has greatly invested in renewable energy in Africa where they have exported the majority of the renewable energy technologies to Africa, including South Africa.

The participants stated that there are social and economic matters that require Eskom to consider community projects, rather than individual ones, where the whole community is involved in taking responsibility for looking after the SSEGs assets and guarding them from theft and vandalism. Pandarum and Mbam (2023) stated that community-based projects benefit Eskom and the communities where they both make profit from the renewable energy market. The energy storage systems are best suited for community projects. Löser and Bekker (2022) in their research on BESS reported the financial value and the energy transformation it brings to the utility and to the customer.

5.4.3.5 Government and policies

There is a need to have a strong national plan and policy, according to the participants, that can introduce a funding scheme to cater for the SSEGs. Mutereko et al. (2024) noted that the implementation of supportive policies can help in developing a skilled workforce in the renewable energy sector through the provision of training programmes, funding support, collaboration with stakeholders in the industry, job placements support, and public awareness promotions.

The participants stated that the government could reduce import taxes and input duties for solar panels and inverter batteries or other renewable energy equipment to make the cost of installation less prohibitive to customers. Bridle et al. (2022) stated that there are a few tax exemptions that project developers have access to, which makes the cost of installation more affordable to the customer. The participants indicated that Eskom needs to start looking at how to entice customers through existing customer service suites such as the magnificent seven options.

The participants stated that South Africa needs to embrace green energy to keep trading with Europe, Brazil and India as they are currently charging the country high taxes and duties for imported products due to the use of use coal in the country's industrial production. This view was supported by the findings of research undertaken by Bridle et al. (2022) who established that South Africa may face higher import duties for some of its carbon-intensive goods if countries implement border carbon adjustment mechanisms, however, there is a 3-year penalty-free period that would apply until 2026. It was therefore suggested by the participants that the country needs to reduce carbon emissions to remain competitive in international trade.

5.4.3.6 Eskom's organisational challenges

In the previous discussion in this chapter, it was mentioned that it is critical to avoid lengthy waiting time for customers to register their installations. In this regard, the participants suggested that Eskom must consider keeping stock of renewable energy equipment to ensure that customers have supplies when they need to partner with Eskom. The participants noted that Eskom rushes to implement strategies too soon before a change management plan is drafted. They therefore suggested that a change management plan be drafted to guide the implementation of small-scale renewable energy projects.

The participants' view on the Distribution business is that it must be taken beyond being a wires business, therefore continuous training and development of skills for the teams to adapt to continuous business changes is required. An opportunity was identified by the participants for Eskom to contract for installation and maintenance as some of the SSEG customers might not have the maintenance capability. Eskom also suffers a great deal of theft and vandalism on the network, therefore the participants suggested that Eskom should provide the communities with a sense of ownership of the Eskom network as the number of generators increases in the network.

5.4.4 Theme: Other aspects of the small-scale renewable energy market in Eskom Distribution

This theme relates to the last part of the questions posed to the participants in the interviews where they were afforded a chance to add anything else that they felt was related to the topic. The sections below presents the discussion of the issues that they identified as important to be borne in mind in Eskom's move to promoting renewable energy generation.

5.4.4.1 Addressing efficiency

In the previous discussions, the participants noted the effects of 'red tape' in the registration process and their view was that the processes should be expedited to avoid factors that could cause delays. According to the participants, Eskom must improve the marketing strategy and inform customers on how the registration process works to acquire more customers in the network grid for both grid-tied and off-grid connections. The participants further alluded to the requirement for different business units in Eskom where renewable energy will be a dedicated unit for efficient execution.

5.4.4.2 Drive towards manufacturing renewable energy equipment

The views of the participants were that Eskom can build its own renewable energy plants closer to the substations, reducing energy losses and connecting in closer range for the customer.

The participants stated that the success of the programme will require coordinated effort from all stakeholders, in-depth research and development in partnership with educational institutions, and continuous innovation to advance the local technologies. Within the controls of this project and future organisational renewable energy structures, the participants believed Eskom could be allowed to manufacture the PV equipment and batteries within the SSEG space.

5.4.4.3 Customer installations and maintenance

The participants cited the following points of discussion in relation to installations and maintenance.

i. Eskom should encourage safe installations of inverters and PVs which can affect the grid if wrongly installed.
ii. Eskom could design and install renewable plants for its customers and avoid third party costs to the customer.
iii. Eskom should inspect customer installations for quality.

5.4.4.4 Cost and revenue insights

The participants noted that currently renewable energy is out of reach for low-income households in South Africa. The country has a high unemployment rate, but Eskom still needs its customer base to have access to renewable energy. They stated that government incentives can help in the deep rural areas where there are schools that might not be able to afford this type of technology, and customers who are not creditworthy can be covered by the National Treasury for a certain percentage (e.g. up to 20%). This can help to get everyone involved. Affordable energy is discussed in various source in the literature as part of the energy transition to renewable energy. Mukoro, Sharmina and Gallego-Schmid (2022) indicated in their research that the access and affordability further confine the market segment for customers that are already under-served. They stated that their value proposition for the business models under consideration in their study was to provide affordable and simple ‘plug-and-play systems’ and consumer financing on a ‘rent-to-own basis’ to reduce implementation barriers.

The EGI engineering report has been cited by the participants as being too expensive for most customers, and it is a stumbling block for most potential customers. If this could be rectified it will improve the number of connections. Participants indicated that there are other means to incentivise customers to become legal but the cost of the EGI engineering report is a big hindrance.

According to the participants, the rules for energy banking are that a customer cannot export more power than what they use, but the administration fees are excessive and customers who export a small amount of kilowatt hours pay administration fees that are higher than the offset value; therefore the customer gets no

benefit and, if anything, they are worse off financially. Participants suggested that Eskom should relook at the pricing of administration fees if the aim is to have more customers to participate.

5.5 Conclusion

In this chapter, the discussion was aligned to the overview of the literature presented in Chapter Two, and to the presentation of the findings of the study in Chapter Four. Chapter Two provided a link between the available literature that has been studied to align with the research objectives while Chapter four provided Clarity on the findings from the data collected from the Eskom Distribution participants interviewed in terms of their responses to the questions set in line with the research objectives on the significance of Eskom Distribution's participation in the small-scale renewable energy market. The following chapter concludes the research with recommendations based on the literature review.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The previous chapter presented a comprehensive discussion of the findings in light of the literature reviewed in the study. This chapter presents the overall conclusions that can be drawn from the research, and proposes recommendations for Eskom Distribution in its expansion to the inclusion of renewable forms of energy generation. Recommendations for future research will also be made, and finally, the limitations, of the study will be outlined.

6.2 Presentation of conclusions

The aim of the study was to examine the significance of the small-scale renewable energy market for Eskom Distribution. Three objectives were derived to define the aim of the study. The overall conclusions of the study that can be drawn from the participants' interview responses are outlined below.

6.2.1 Objective 1: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution

The views of the participants were that Eskom's supply constraints which resulted in load shedding from 2007 and the increase in electricity cost, drive the implementation of the small-scale renewable energy programme initiated in Eskom. The participants further stated that Eskom started late to implement the project and is running behind as the market is at an advanced stage compared to Eskom. Eskom's participation in the renewable energy market will also support the small-scale renewable energy customers who need to register their installations and make them safe to use and operate. Eskom is viewed as the main stakeholder for South Africa to fully implement renewable energy strategies in the country, therefore participation is required for the government to comply to its commitment to reduce carbon footprint.

6.2.2 Objective 2: To identify the benefits of the small-scale renewable energy market for Eskom Distribution

Energy security was mentioned by the majority of the participants as the benefit of Eskom's participation in the renewable energy market in terms of the relief that will be brought to a constrained conventional electricity generation fleet. Small-scale renewable sources can be used for self-use or to electrify nearby communities or consumers and can be grid-tied or off-grid.

The other benefit to Eskom, according to the participants, will be to regain or retain the customers that are using small-scale renewable energy plants by supporting them through the registration and licensing process of their installations. There will be substantial savings from participating in the small-scale renewable

energy market for Eskom Distribution, such as reduced capital costs for network expansion and maintenance. Energy bought from the small-scale renewable energy generators will be much cheaper as there will be fewer energy losses that may add on to the costs to customers. There will be reduced energy demand from Eskom and ultimately there could be reduced safety concerns due to outages that come with costly risks.

Eskom's participation in the small-scale renewable energy market will benefit other stakeholders, for instance, the customer will resume a revenue stream by offsetting excess power back to the grid, and developers can be included who will offer financial support and job creation. With an increase in developers, financial institutions can increase provision of funding needed and educational institutions for research and development of products and services related to the implementation of renewable energy systems can also be included in the rollout of renewable energy generation.

6.2.3 Objective 3: To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution

The network grid does not fully support more connections of small-scale renewable energy generators in its current state. Network expansion will be required to accommodate more SSEGs unless they are off-grid. The participants indicated that the registration process is long and cumbersome and does not encourage those consumers that have installed the SSEGs to come forth to legalise their installations. Besides the process being long, it is also expensive for the customers that want to venture into renewable energy and is not affordable for the unserved communities who would benefit from remote or virtual access to electricity. Currently, there are not enough incentives and funding to encourage more users to join this market.

The participants also mentioned that Eskom processes take time to conclude on a single connection while the private sector moves faster with the connections. This will disadvantage Eskom in retaining ad acquiring more customers. The participants indicated that the reliability of supply is not guaranteed from the renewable energy generators, therefore Eskom cannot firmly include its capacity in its network planning. Materials absence also delays customer connections. There are limited manpower skills when it comes to renewable energy in Eskom. The registration process requires ECSA registered engineers to sign off registration reports. The participants further indicated that there is not enough public knowledge for this market and customers are not fully conversant of the benefits it can offer. Participants also alluded to ensuring that there is a standard approach within the utilities to eliminate customer frustration and resistance.

6.4 Recommendations to Eskom Distribution

The following recommendations are made for Eskom to realise the significance of participating in the small-scale renewable energy market:

Network improvement and expansion: There needs to be more capital injection to improve the voltage instabilities experienced when connecting SSEGs and network expansion to the areas where there is a potential for more customers that can participate in the small-scale renewable energy market.

Improved customer participation: This will be achieved through frequent customer engagements as suggested by the participants. Customer education will help the customers to be more informed about the product and make an informed decision.

Reduced connection costs: More customers will come through if the costs to connect are more affordable and there are incentives for the customer to connect. Reduced connection charges will also allow more customers to participate in the renewable energy market.

Manpower training: This will not only help Eskom but could also be advantageous to the customer if Eskom has skilled employees that would take the process of registering their installation from the beginning to the end without requiring third party support, that is an additional cost to customer. For Eskom, training its resources will help speed the slow process of registration and bring about research and innovation opportunities to have locally produced materials and other technological solutions for renewable energies.

Legal and process handling improvement: Eskom needs to facilitate its smooth operations with NERSA to reduce the time it takes to register an installation. This will encourage more customers to legalise their installations or make an informed choice to use grid-tied, off-grid or hybrid renewable energy solutions instead of doing nothing and missing opportunities of independence from the grid, while alleviating grid constraints.

Implementation of small-scale renewable energy systems: It is recommended that Eskom continue with the implementation of renewable energy as it is long overdue and will assist Eskom to alleviate grid constraints and reduce carbon footprint, which in turn will increase opportunities for more investment with other countries when South Africa reduces carbon emissions and ultimately improves the economy of the country.

6.5 Limitations of the study

The University of Southern California (2025) defined limitations of a study as the design or methodology characteristics that influenced or impacted the interpretation of the findings from a research study. It stated

that study limitations are meant to restrict the possibility of generalising the findings, and to further describe the ways in which the researcher initially chose to design the study, and the method used to establish internal and external validity of the findings.

This study is limited to Eskom Distribution managers referred to as MPG Bands (Managers, Professional Senior Engineers, and General Senior Advisors), who are non-bargaining employees and are involved in the small-scale renewable energy project in the Central East cluster, which is a merger of the FS and KZN Provinces. Because Eskom Distribution has made slow progress in the implementation of small-scale renewable energy technology, the level of subject knowledge amongst the levels of employment in Eskom Distribution justifies the need for the study to be focused on the decision making process, which was obtainable from the management employees that are participating in the renewable energy market for Eskom Distribution. The findings are validated based on the number of participants sampled for this qualitative study.

6.6 Recommendations for future research

It is recommended that future research consider a quantitative or a mixed methods approach in understanding the topic of the benefits and challenges in Eskom's involvement in the renewable energy market, drawing on a larger sample. The participants of this study were all Eskom employees. It would be interesting to establish different views from the energy industry and sector in general, drawn from other sources. .

6.7 Conclusion

The motivation of this study was based on determining the opportunities and benefits that were foreseen by participants as driving the implementation of small-scale renewable energy generation in Eskom. Eskom was regarded as regime resistant when it comes to the renewable energy market, due to the fossil footprint that has been the hallmark of the entity since its establishment. Renewable energy solutions emerged at a time when Eskom needed an alternative source of energy to produce electricity. The findings of the study showed that, while there may be challenges in Eskom's initiative to onboard small-scale electricity customers, that the benefits of including these prosumers into the existing grid will help to alleviate the major concern of ensuring long-term consistent energy supply to all in South Africa in the long term.

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APPENDIX A: ETHICAL CLEARANCE

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

07 May 2024

Nozipho Innocentia Mpanza (223138003)
Grad School of Bus & Leadership
Westville Campus

Dear NI Mpanza,

Protocol reference number: HSSREC/00006934/2024
Project title: The significance of the small-scale renewable energy market for Eskom
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 26 April 2024 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

Incidents of adverse events and serious adverse events (AEs and SAEs) should be reported in writing to HSSREC, the study sponsors, and any regulatory authority (where appropriate), within 7 working days of the occurrence for local sites and 14 days for all other South African sites.

This approval is valid until 07 May 2025.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)
/dd

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

APPENDIX B: GATEKEEPER'S LETTER

Eskom

Prof. Cecile Gerwel Proches
Graduate School of Business Leadership
University of KwaZulu Natal
Westville Campus
Durban
3630

Date:

2024/03/15

Enquiries: Zelda Kassimatis
051 404 2768/031 710 5345

Dear Prof. Cecile Gerwel Proches

RE: PERMISSION TO CONDUCT RESEARCH

This letter serves to confirm that I, Agnes Mlambo, General Manager in Eskom Distribution Central East Cluster, hereby acknowledge and approve the research of Nozipho Innocentia Mpanza, student number 223138003, within Eskom for the completion of her MBA degree.

[redacted]

Full Name: Agnes Mlambo

18/03/2024
Date:

General Manager: Central East Cluster

APPENDIX C: INFORMED CONSENT LETTER

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL
For research with human participants

INFORMED CONSENT RESOURCE TEMPLATE

Information Sheet and Consent to Participate in Research

Date:

To whom it may concern

My name is Nozipho Innocentia Mpanza from the UKZN Graduate School of Business and Leadership, currently enrolled for the Master of Business Administration (MBA) with contacts at [redacted] and 22138003@stu.ukzn.ac.za.

You are being invited to consider participating in a study that involves research in the significance of the small-scale renewable energy (Small Scale Energy Generators, SSEG) market for Eskom. The aim and purpose of this research is to examine the significance of the SSEG market for Eskom Distribution, which will provide an alternative electricity source and reduce carbon footprint. This is the first big step of Eskom taking direct business participation in small-scale renewable energy systems. The study is expected to enroll sample of 20 Eskom Managers in various departments and positions in two Provinces, namely Free State and KwaZulu-Natal. These Provinces, according to Eskom Distribution Demarcation, form a Cluster called Central East Cluster.

The study is funded by Eskom Distribution Division. The study will provide no direct benefits to participants. I hope the study will provide the following benefits to the organisation: Insights into opportunities for Eskom Distribution to profit and grow in the SSEG market; stakeholder gains in partnering with Eskom on this journey of SSEG.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number_____).

In the event of any problems or concerns/questions you may contact the researcher at 223138003@stu.ukzn.ac.za or [redacted] or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Participation in this research is voluntary and participants may withdraw participation at any point. In the event of withdrawal of participation the participants will not incur penalty or loss of treatment or other benefit to which they are normally entitled. There will be no consequences to the participant for withdrawal from the study, but the participant will be

required to withdraw in writing for record keeping and for a search for a replacement participant.

No costs will be incurred by participants as a result of participation in this study and there will be no incentives or reimbursements for participation in this study.

Data will be collected using MS Teams recording and results will be stored in a common file which will be used for analysis.

CONSENT

I ..... have been informed about the study entitled, The significance of the small-scale renewable energy market for Eskom, by Nozipho Innocentia Mpanza.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at 223138003@stu.ukzn.ac.za or [redacted]

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to:
Audio-record my interview YES / NO

_____ _____
Signature of Participant **Date**

_____ _____
Signature of Witness (Where applicable) **Date**

_____ _____
Signature of Translator (Where applicable) **Date**

APPENDIX D: INTERVIEW QUESTIONS

PARTICIPANT'S POSITION		**TASK GRADE**	
PROVINCE		**DIVISION**	
DEPARTMENT			

WELCOME & INTRODUCTION

My name is Nozipho Innocentia Mpanza from the UKZN Graduate School of Business and Leadership, currently enrolled for the Master of Business Administration (MBA). Thank you for your participation in a study that involves research into the significance of the small-scale renewable energy market for Eskom. The aim and purpose of this research is to examine the significance of the small-scale renewable energy market for Eskom Distribution, which will provide an alternative electricity source and reduce carbon footprint.

CONFIRMATION OF PARTICIPANT'S ANONYMITY

There will be no mention of any participant's name in the data analysis. Please refer to the informed consent form for further information.

INTERVIEW QUESTIONS
Objective 1: To identify the importance of participating in the small-scale renewable energy market for Eskom Distribution.
• Describe the small-scale renewable energy market for Eskom Distribution
• When was the small-scale renewable energy market initiated? Describe the process involved.
• Who are the stakeholders involved and what is their role?
• Why would Eskom Distribution want to venture into the small-scale renewable energy market?
Objective 2: To identify the benefits of the small-scale renewable energy market for Eskom Distribution.
• What are the benefits for Eskom Distribution of taking part in the small-scale renewable energy market?
• How do the various stakeholders gain in the small-scale renewable energy market?
Objective 3: To determine the challenges of participating in the small-scale renewable energy market for Eskom Distribution.
• Where are the bottlenecks for Eskom Distribution in venturing into the market?
• What can be done to improve the rollout of the initiative?
• What recommendations do you have to make for the small-scale renewable energy market to be more accessible to Eskom Distribution?
• Do you have anything else to add regarding Eskom Distribution's initiative to participate in the small-scale renewable energy market?
CLOSURE
Thank you for participating in this interview. Your support is greatly appreciated.

APPENDIX F: EDITOR'S LETTER

Write Start Editing

14 July 2025

To Whom It May Concern:

Re: Editing of Masters dissertation – Nozipho Innocentia Mpanza

This letter serves to confirm that I have indeed edited Nozipho Mpanza's Master of Business Administration dissertation titled 'The significance of the small-scale renewable energy market for Eskom'. The specific areas that I paid attention to in the dissertation were:

- **Language:**
  Sentence structure, correction of grammar, coherence, clarification of expression, syntax, spelling and punctuation;
  Logical flow of ideas within and between paragraphs and sections;
- **Referencing:**
  Cross-checking in-text with Reference List entries;
  Looking up of missing references;
  Correction of format of in-text and Reference List entries;
- **Formatting:**
  Spacing between headings and paragraphs, consistency of size and style of fonts used throughout the thesis;
  Correction of numbering of sections and subsections;
  Correction of format of table and figure headings;
  Formatting of Table of Contents, List of Figures, List of Tables & List of Acronyms;
  Correction of page layouts and overall appearance of thesis;

Please do contact me if you require clarification regarding any of the above matters pertaining to Mrs Chauke's dissertation.

Yours sincerely,

Ms Serrenta Naidoo
Writing Centre Coordinator/Professional Language Editor
Tel: 031 260 2121/ Email: naidoos2@ukzn.ac.za