ACCESS TO GREEN ENERGY FINANCING IN KENYA: CASE STUDY OF PRIVATE SOLAR ENERGY PROJECTS

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DECLARATION

This research project is my original work and has never been presented for examination or any other award in any other University or Institution.

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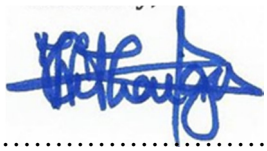

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DEDICATION

This research project report is dedicated to all my friends and colleagues who kept pushing me to ensure I deliver and graduate. It is also dedicated to my family and most of all to the Lord Almighty for enabling me to see it through.

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ACRONYMS AND ABBREVIATIONS

AFD	-	Agence Française de Développement
AREF	-	Africa Renewable Energy Fund
GCF	-	Green Climate Fund
CBK	-	Central Bank of Kenya
CO2.	-	Carbon Dioxide
CRBs	-	Credit Reference Bureaus
C&I	-	Commercial and Industrial firms.
DF I	-	Development Finance Institution
EE	-	Energy Efficiency
EIA	-	Energy Information Administration
EPCs	-	Engineering, Procurement and Contracts
EEP	-	Environment Partnership Trust Fund
ERC	-	Energy Regulatory Commission
EPRA	-	Energy & Petroleum Regulatory Agency
ESIA	-	Environmental & Social Impact Assessment
FIs	-	Financial Institutions
FiT	-	Feed in Tariff
FSD	-	Financial Sector Deepening
GCF	-	Green Climate Fund
GESIP	-	Green Economy Strategy & Implementation Plan
GREEREF	-	Global Energy Efficiency & Renewable Energy Fund
Gt	-	Gigatonnes
GDP	-	Gross Domestic Product
GHG	-	Green House Gases
GOK	-	Government of Kenya
IEA	-	International Energy Agency
IRENA	-	International Renewable Energy Agency
IFIs	-	International Finance Institutions in Kenya
ICT-		Information and Communications Technology
JRC	-	Joint Research Centre
IPP	-	Independent Power Producer
IPCC	-	Intergovernmental Panel on Climate Change
MFBs	-	Microfinance Banks

MSMEs - Micro Small and Medium Sized Enterprises
MRPs - Money Remittance Providers
MW - Mega Watts
NACOSTI- National Commission for Science, Technology and Innovation
NEMA - National Environmental Management Authority
KSH - Kenya Shillings
KOSAP - Kenya Off-Grid Solar Access Project
KW - Kilo Watts
KAM - Kenya Association of Manufacturers
KEREA - Kenya Renewable Energy Association
NCCAP- National Climate Change Action Plan
NGO - Non-Governmental Organization
NSE - National Securities Exchange
OECD - Organization for Economic Co-operation and Development
PAYG - Pay-as-you go
PV - Photovoltaics
SMEs - Small and Medium Sized Enterprises
SDGs - Sustainable Development Goals
REFs - Renewable Energy Firms
RBF - Results-based Financing
SSA - Sub Saharan Africa
SUNREF - Sustainable use of Natural Resources and Energy Finance
RBF - Results-based financing
RE - Renewable Energy
RERAC- Renewable Energy Resource Advisory Committee
REREC- Rural Electrification and Renewable Energy Corporation
UN - United Nations
UNDP - United Nations Development Program
UNEP - United Nations Environment Program
UNFCC - United Nations Framework Convention on Climate Change
USD - United States Dollar
VAT - value added tax
WB - World Bank

ABSTRACT

In Kenya, despite the advanced policy and regulations in place as well vibrant financial services sector the level of investment particularly within the private sector remains low. This is despite the enormous potential by the private sector to substitute government efforts in the production. Financing not only bridges the gap between availability and investment in any industry but it's a key enabler for growth. The significance of the study is pegged on the capital-intensive nature of the renewable energy industry (estimated at 90% cost of infrastructure of total lifetime costs) with low operating costs. Availability of low-cost financing can reduce clean energy costs by as much as 20% in developed countries and 30% in developing countries hence the significance of conducting the study.

The study aimed to investigate access to debt financing of Renewable Energy in Kenya with a focus on solar projects within the private sector. The study focused on; (i) review of the policy and regulatory environment necessary for investment in Renewable Energy (ii) the financial technical capacity available to develop bankable proposals as demand side factors affecting financing and (iii) the business requirements needed by financial institution's to access funding, and (iv) perceived risks faced by financial institutions as key supply side factors affecting financing in addition to identifying key challenges faced in accessing financing as well as the opportunities available in improving access to financing.

The study adopted both the descriptive and cross-sectional research designs, targeting 41 Private Solar Energy Firms and 41 Commercial Banks in Kenya, bringing the total target population to 82. The study adopted a mix of probability and non-probability sampling. Under probability sampling the response rate was 84%. Under non-probability sampling techniques, the study adopted purposive sampling to select key informants who comprised of 4 commercial banks that provide green lending and 3 renewable energy firms that have previously benefitted from green funding. One (1) key informant from each of the 7 firms was selected from a relevant senior management cadre. The study made use of primary data which was both quantitative and qualitative in nature. While quantitative data was collected using a structured questionnaire, qualitative data was collected using a key informant interview guide. Secondary data was also collected from academic papers, historical records, statistical databases and government publications sourced from internet government agencies and library. Employing a mixed-method

approach, data was analyzed by both quantitative and qualitative data analysis techniques. Quantitative analysis comprised both descriptive and inferential statistics. Descriptive analysis involved frequency counts, percentages, and means while inferential statistics were analyzed using both Pearson correlation and regression analyses. The regression analysis was utilized to establish the association between the predictor and outcome variables and subsequently test the study hypotheses. The qualitative data from both primary and secondary data was on the other hand analyzed through thematic content analysis.

Results indicate that demand side finance factors ($\beta = 1.192$, sig.=.000<.05), supply side finance factors ($\beta = -.644$, sig.=.008<.05), financing challenges ($\beta = .174$, sig.=.045<.05) and financing opportunities ($\beta =.300$, Sig.=.002<.05) significantly influence access to green energy financing among private solar firms in Kenya at 95% confidence level. The study also revealed challenges and gaps in both the demand and supply side as follows: On the demand side the study revealed issues such as; bureaucratic processes in license approvals, inconsistence and instability in the policy and regulatory environment, monopolies in pricing and distribution of electricity, and limited technical capacity to develop bankable proposals which ultimately creates a non-competitive environment which puts off private investors hence limits the demand for credit and ultimately Investment for the private sector.

On the supply side: the study revealed issues such as: inconstancies across financial institutions on requirements for access to credit including variations in repayment terms, higher cost of credit, limited understanding by financial institutions on financing mechanisms hence poor risk assessment criteria's and too much documentation by local financial institutions. These factors discourage renewable energy firms hence they seek local credit as a last resort. In addition, the stringent measures put in place by financing institution's including shorter repayment periods and insistence on collateral as well as high cases of default and poor quality of financial proposals leads to financial exclusion for those who are unable to live up to the requirements, and ultimately leads to limited supply of financing by financial institutions by the private sector. The study also revealed high cases of default and poor quality of financial proposals

The following opportunities were identified as an avenue for increasing access: the ever-increasing demand for clean electricity, overwhelming present of International financial institutions (IFIs) in Kenya, new financing mechanisms for renewable energy projects, and decrease in technological cost for Renewable Energy. In conclusion, the study revealed a dominance of government-led

financing environment which has suppressed the growth of the private sector by eliminating market-led competition.

In consideration of the key finding on the challenges in accessing financing both from a demand and supply perspective, there is need for a financial intermediary that can bridge both the demand and supply gaps, in this regard, the study recommends establishment of an institution that can provide guarantees that cover the high risks involved within this sector as well as provide technical assistance and financial advisory services in order to encourage renewable energy firms to voluntarily seek local debt financing. On example is the Uganda Energy Credit Capitalization Company (UECCC) which provides guarantees, refinancing, cash reserving, liquidity refinance, bridge financing, and interest rate buy down to the energy sector. The study also recommends further academic research on the overall sources of financing of renewable energy project in Kenya by the private sector including equity financing as a buildup of this study.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Energy is a central pillar in achievement of Sustainable Development Goal (SDG) 7: Affordable and clean Energy (WEHAB Working Group, 2002). Currently, brown energy pollution accounts for 76% of greenhouse gas emission estimated at 37.2 $GtCO_2$ e. (Bruckner *et al.*, 2014). It is because of this that the Paris Agreement signed December 12, 2015 came to existence with the aim to limit increase of CO_2 to 1.5°C and reduce the effects of both of climate change and global warming. The United Nation's Framework Convention on Climate Change (UNFCCC) conference of parties (COP 21) proposed to keep average global temperature well below 2°C (Stocker *et al.,* 2014). As result of these efforts, there has been an increased demand for production of renewable energy and further increase in global demand for investment in renewable energy.

According to the United Nation's 2018 reporting brief on accelerating SDG7 and in particular SDG 7.2: 'Increase substantially the share of renewable energy in the global energy mix by 2030', there is need to mobilize greater political good will and cooperation with higher levels of public and private investment sources towards increased investment in renewable energy so as to ensure increase in global uptake and consumption of renewables to 85% by 2050 as set by the Intergovernmental Panel on Climate Change (IPCC). According to Gielen *et al.* (2019) at global level, investing in renewable energy is projected to reduce energy-related greenhouse gas emissions by about one-third by 2050 however, for this to be achieved the total renewable energy mix globally must rise from around 15% of total primary energy supply in 2015 to around 66% in 2050. Gielen *et al* (2019) note that transition towards a green economy is possible through investing 2% of Global gross domestic product (GDP) per capita per year in renewable energy Infrastructure to kick-off a transition towards a low-carbon emission by 2050. According to Corrocher and Cappa (2020) the level of renewable energy investments required to attain the Paris Agreement climate goals were set at USD 800 billion by 2050. However, only USD 322 billion had been invested by 2018, which has seen negative growth by the beginning of 2020 due to the COVID-19 pandemic.

The rate of private financing for green energy investments is still low around the world however, funding of private solar firms' projects in developed countries is different from those of developing countries. In Brazil, private solar firms can only get funding from the government and donor agencies. However, the funding has mainly targeted rural electrification project under the Rural Power Supply Program established by the government (Bhattacharyya, 2013). However, state governments only contribute 10% of the cost. In India, funding for off-grid solar projects is only provided by the central and provincial governments (Bhattacharyya, 2013). Therefore, there is limited funding for large off-grid solar projects by the private sector.

In China, renewable energy projects have benefited from low-cost financing that is provided by the central government through the state-owned banks such as the China Development Bank (Cosbey, 2014). Private organizations have also been forced to seek financial support from the provincial government through a cost-sharing scheme (Bhattacharyya, 2013). However, public financing has only been available for large developers and major solar and wind companies around the country. Renewable energy developers in China have relied on government schemes to fund their projects. For example, in 2010, the government through the China Development Bank provided an estimated $36.8 billion to renewable energy enterprises in form of loans (Shen *et al* 2013). In 2010, the government of China entered into a partnership with the private sector to finance green energy investments. Through this agreement, the government encouraged the private sector as a way of restructuring the country's financial institutions. However, enough efforts and policies were not put in place to ensure that the private sectors full involvement in the financing process of green energy (Chiu, 2017).

Unlike China, Japan has been clear on the level of private sector involvement in green energy financing as presented to the United Nations Framework Convention on Climate Change (UNFCCC) Fast Start Finance Report (Kuramochi *et al.,* 2012) which outlines several initiatives for financing clean energy. The report outlines that out of the $15 billion pledge that Japan gave for financing clean energy, $4 billion was to come from private financing of which $3 billion of the private financing would go towards supporting developing countries investing in the green energy sector Kuramochi *et al.* (2012). Some of the public entities that have worked with the private sector to improve clean energy financing have included Japan Bank for International Cooperation, Nippon Export & Investment Insurance, and Japan International Cooperation Agency (JICA) among others.

In Africa, access to green energy financing within the private sector has faced many challenges, in addition to this, Inderst and Stewart (2014) note that for developing countries political and economic concerns can drive up the borrowing cost by 2% to 6%. In South Africa for instance, funding for private solar projects is provided under the Integrated National Electrification Program. Through this program, the government has provided $160 million each year for solar projects (Bhattacharyya, 2013). However, the funding is provided with the assurance that such projects will be self-funding in a given period (Bhattacharyya, 2013). It has led to some projects, and especially private ones, not getting enough funds. The commercial banks have also been financing the private sector in In South Africa (Baker, 2015). Private players in South Africa have also received funding from export credit agencies, development finance institutions, equity investment and pension and insurance companies. Some of the players that have provided equity investment include technology and investment funds, community trusts, and international companies such as Google (Baker, 2015). However, it has not been sufficient to support clean energy projects.

In Morocco, private sector funding for clean energy has mainly come from international organizations. In 2015, The European Bank for Reconstruction and Development (EBRD) invested $250 million to private-sector clean energy companies in Egypt, Morocco, Jordan, and Tunisia among others (El-Katiri, 2016). The funds were provided in the form of equity financing and debts. While such financing has been helpful, they have only targeted projects that are of interest to the financier's e.g. the $250 million provided by the European Bank of Reconstruction & Development for solar and wind power projects. Other organizations that have provided funding for clean energy projects in Morocco have included African Development Bank (ADB), World Bank (WB), and the French Development Agency (AFD) among others (El-Katiri, 2016). Therefore, access to clean energy financing by the private sector in Africa has mostly been reliant on government and international support.

In Tunisia, while providing loans for solar water heaters, financing guarantees are provided through development finance or governments underwrite loans through commercial banks (Fund, 2017). In this case, commercial banks provide loans which are guaranteed by state utility companies and repaid through customers' electricity bills hence transferring credit risks to borrowers holding them more accountable for repayment. In cases of default, the government utility providers absorb some or all the risk through measures such as withholding Customers'

services. In Kenya, UNEP Finance Initiative and the Green Growth Action Alliance are addressing the perceived asset-liability mismatch (Fund, 2017). They have done this by developing a takeout finance facility since local lenders are unable to lend beyond seven years whereas project developers seek 15-year loans hence unable to access adequate financing.

In East Africa, private sector support in financing Renewable Energy has been supported both by government efforts and development financial institutions for instance in June 2021, European Investment Bank (EIB) approved funding towards renewable energy amounting to EU 80 million (European Investment Bank, 2021)**.** In Uganda for instance, according to the OECD (2018), in the year 2016/2017 the total financing for the renewable energy in Uganda is estimated at USD 3.1 billion 70% of which is from the private sector solar power being the second largest share of renewable electricity. In addition, financial institutions are also providing working capital loans with credit support from the Uganda Energy Credit Capitalization Company (UECCC) which provides services such as technical assistance and financial advisory services to financial institutions and electricity producers in areas such as guarantees, refinancing and interest rate buy down among others. The institution has provided solar loan product amounting to USD 1.5 Million as well a solar working capital facility for an estimated USD 8.5 Million among others (Environmental Alert report, 2018). In addition, Probst, *et al.* (2021) notes that Uganda has attracted USD 453 million in private sector investment in only three years for small renewable energy projects.

In the Kenyan market, government partnerships with development partners is also dominant in the Kenyan market. Projects such as the Kenya Off-Grid Solar Access Project (KOSAP) 2018-2023 have been developed with an aim of boosting financing of private renewables through results-based financing (RBF), local currency working capital and debt Facilities as incentives to private sector companies for operation and sale of solar and clean cooking technologies in 14 project beneficiary counties within Kenya (Nyamongo & Nyamongo, 2020). In addition, until recently, commercial banks have shown interest in partnering with development financial institutions so as to offer financing at an improved rate. The blended financing is able to address the de-risk challenges through guarantee's, direct investment and concessional financing through credit lines (Megumi, Caguioa & Alterescu, 2020). This is aimed at the development of the green investment market. An example is the green credit line offered by AFD (French Development Agency) through the Commercial Bank of Africa (CBA) in 2015 November to 2019 worth 10 million Euros

to finance renewable energy and energy efficient projects targeting only private firms. In addition, the Kenya Commercial Bank (KCB) previously accredited by the United Nations Green Climate Fund in 2020, became the first financial intermediary in East Africa to receive USD 150 million from the International Finance Corporation (IFC) to finance environmental and climate change projects in Kenya.

The Landscape of Climate Finance in Kenya report (GoK, 2021) states that in 2018 locally based banks in Kenya provided 81% of all tracked domestic private sector climate-related expenditures amounting to Ksh 27 billion towards renewable energy projects, supplying concessional loans or credit lines for energy efficiency and wastewater management, among others. In comparison to the Climate Finance Landscape Report: South African (2020) which states that Commercial Banks in South Africa are currently providing 67% of the financing for renewable energy projects. According to Megumi, Caguioa and Alterescu (2020), commercial banks in Kenya plays a minimal role in lending on and off grid to private sector this is mainly due to the fact that they cannot access affordable capital to lend to borrowers not unless it's through partnering with international organizations. In addition, foreign funds are affordable, however they are subject to fluctuations of exchange rates, which in turn increases the cost of finance (Dhruba, 2018).

It is with this regard that the study aims to investigate access to the renewable energy financing by the private sector including; demand and supply finance factors affecting the provision of financing and challenges and opportunities of access to Renewable Energy financing in Kenya. The study shall identify and focus on selected case studies of private sector firms dealing in Renewable Energy and financial institutions offering credit facilities for renewable energy projects and solar in particular.

1.2 Problem Statement

Finance is key in determining the growth and sustainability of any industry especially within the private sector it allows businesses to undertake productive investments, creates employment as well as adds to the contribution the national economy. Within the renewable energy sector financing is very detrimental since the sector relies on renewable energy technologies that requires heavy investment in infrastructure as well as technical knowledge of these technologies. According to Olang and Esteban (2017), non-governmental-related lending including private banks and cooperative societies is the second most important source of financing for Renewable Energy projects in Kenya following government partnership financing. Bronicki (2000), notes that private sector financing for renewable energy projects in Kenya is vital to the long-term commercialization of renewable energy since it substitutes government efforts in increasing the rate of electrification specifically within the rural areas. However, according to (Bhattacharyya, 2013), the renewable energy sector in Kenya is still yet to be fully commercialized with domestic funds available being limited and expensive while foreign funds are subject to fluctuations of exchange rates, which increases the cost of financing (Dhruba, 2018).

Most private-sector renewable energy producers in Kenya experience challenges that hinder the development of this sector some of which include; lack of funding brought about by high upfront costs of clean technologies and limited access to finance (Boyle *et al.,* 2014); reluctant of financial institutions to finance Renewable Energy due to the perceived risks and unavailability of suitable financial products the (IEA, 2015) ; the UNDP (2013) additionally notes that the barriers hindering adequate transition to renewable energy for developing countries are not only disproportionate subsidies and technology costs but affordable long-term financing.

There is also big gap between local and international sources of financing in Kenya with local financial institutions struggling to provide debt financing to local renewable energy firms due to the capital-intensive nature of the industry as well dealing with the many risks involved. For the private sector, this creates a big challenge since most of the international financing offered for renewable energy are mostly utilized by government funded projects due to the benefits of economics of scale, the mitigation of risk through guarantees. The challenge by the private renewable energy firms in accessing local debt financing is created by the stringent measures put in place by these institution's so as to mitigate the risks involved. UNDP (2020), notes that local

financial institutions struggle to access financing for capital intensive industries such as renewable energy and when financing is provided, it's usually within stringent measures to mitigate the risk involved.

The limited access to commercial finance in financing small and medium size energy projects in Kenya directly translates to low access of electricity by households in energy provision. This is because insufficient access to investment in renewable energy by private investors prevents supplementation of off grid electricity from the national grid for renewable sources such as solar energy, wind, and biomass for household use (GoK, 2016). Despite tremendous strides made by Kenya in renewable energy over the recent years through public finance, development finance, grants/concessional loans, and developmental partners the private sector still attracts relatively low levels of financial investment particularly within the private sector. While most challenges can be attributed to factors such as limited organization capacity, unfavorable policy environment, weak governance that influences the large-scale mobilization of financial resources, these factors withstanding, and the private sector still remains key to increasing the electrification rates in Kenya by substitution of government efforts. It is against this background that the research seeks to investigate in particular factors that affect access to financing of solar electricity within the private sector in Kenya.

1.3 Research Hypotheses

This study was designed to test the following research hypotheses:

H_{01}: Demand side finance factors is not significantly associated with access to green energy financing among private solar firms in Kenya

H_{02}: Supply side finance factors is not significantly associated with access to green energy financing among private solar firms in Kenya

H_{03}: Financing challenges is not significantly associated with access to green energy financing among private solar firms in Kenya

H_{04}: Financing opportunities is not significantly associated with access to green energy financing among private solar firms in Kenya

1.4 Research Objectives

The overall study objective is to investigate access to green energy financing solar power projects in particular within the private sector from local financial institutions in Kenya. This objective was achieved by addressing the following four specific objectives:

i. To determine the demand side and supply side finance factors that affect private solar firms in Kenya.
ii. To investigate the financing challenges facing private solar firms in Kenya.
iii. To analyze the financing opportunities available for private solar firms in Kenya.

1.5 Significance of the Study

Financing is key and cross cutting in any sector much less a capital-intensive sector such as renewable energy hence proper financing mechanisms and structures are important towards up scaling of green energy projects. The study shall bring to light key factors hindering private renewable energy firms from accessing financing from local financial institutions. In particular, the findings will inform the financial institutions on the existing opportunities available for partnership to enhance supply of private renewable energy firms and the successful mechanism in financing renewables. In addition, the study shall provide information to investors on the existing policy and regulatory incentives that promote or hinder the development of Renewable Energy projects in Kenya.

The study shall also enlighten the government especially Ministry of Finance and planning when drawing policies and regulatory measures and guidelines aimed at breaking the barrier of access to finance by the private sector. The findings of this study will generate information that is vital for policy makers in understanding the existing gaps and challenges that limit the potential of solar energy in Kenya including challenges specific to funding renewable energy projects. This can play a role in the achievement of its international obligations outlined in Agenda 2030 of the United Nations in particular the achievement of SDGs 7 on clean and affordable energy and SDG 13 on climate action. By adding to the existing paucity of data in green energy financing the challenges and gaps will be mitigated or addressed leading to unprecedented growth in the solar electricity sector.

The findings will also become a reference point for academics and scholars who are interested in undertaking studies on financing of renewable energy in Kenya particularly on challenges related to barriers on access to financing and its effects on investment.

1.6 Scope and Limitations of the Study

The scope of the study is focused on debt financing of renewable energy projects in Kenya within the private sector with a focus on solar electricity as the case study. Specifically, the unit of analysis shall be access to financing while conducting a comparative analysis of challenges faced from the demand side by renewable energy firms that seek debt financing and supply side by local the financial institutions that supply renewable energy financing.

The study encountered the following limitations: Firstly, the key informant interviews were conducted during the height of the covid-19 pandemic hence efforts for personal interviews by the selected respondents were limited to online platforms like zoom and phone calls. In addition, the data collection period also extensive, this was occasioned by some staff working from home under various working arrangements. This meant that interviews at times experienced some level of distractions.

Secondly, some key informants were not willing to give information about their institution more so those from financial institutions. One key informant insisted on remaining anonymous. While some renewable energy firms where not willing to give financial information about renewable energy projects that are in the inception phase, how they are financed or those in the pipeline of implementation. As a mitigation measure, the researcher kept the identity of the correspondent anonymous so as not to lose out on important findings.

Thirdly, although the study targeted those in relevant positions and with the relevant knowledge for the study as key informants, probability of biasness was high as some of the responses could be personal opinions and not necessarily factual or the standard practice in their organizations. As a mitigation measure the researcher through data analysis siphoned the key findings as well as sought supporting literature on the findings.

1.7 Definition of Concepts

Access to financing: The process of supplying credit to renewable energy firms when needed.

Debt financing: Raising money for capital by selling debt instruments. In the study, debt financing is sought through financial institutions.

Demand side factors: Factors that directly affect or encourages the commercial banks to provide finance to renewable energy firms through guarantees and affordable capital among others. They include investor friendly policies, cheaper interest rates etc.

Equity financing: Raising money through the sale of shares. In the study it could be through partnerships or parent Company funding, sale of shares or reinvestment of cash flows.

Feed-in-tariff (FiT): Instruments developed by the governments aimed at promoting increased generation of electricity from renewable energy sources by allowing independent power producers to sell electricity at pre-determined tariffs within a given period of time.

Financial inclusion: Process of ensuring fair and transparent access to appropriate financial products and services by all at affordable costs (Chakraborty, 2011). It's whereby those seeking financing are able to access it when required

Private sector: Part of the national economy that is not directly under state control

Renewable energy financing: Process of sourcing for a financial instrument to fund a renewable energy technology including equity, debt and grant by solar renewable energy firms.

Supply side factors:	Factors that directly affect or advocate for the supply of financial products by financial institutions to renewable energy firms. The aim to diminish the asymmetries of information between the lenders and borrowers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to analyze on the topic The literature review will give a comparison of the issues that have been raised in other studies with regard to green energy financing in the private sector in Kenya, and specifically, for solar projects. The literature review is organized according to the objectives that have been stated above. The analysis will include comparison of the empirical and the theoretical review, in order to identify research gap, which is expected to create the conceptual framework.

2.2 Empirical Review

The study conducted an empirical review on various factors affecting financing of private RE firms. The empirical literature is discussed along the study variables as stated in the research objectives. These included the demand side finance factors, supply side finance factors, financing challenges and financing opportunities available for private solar firms in Kenya. The literature is reviewed from scholars across global, regional and Kenyan contexts.

2.2.1 Factors Affecting Financing of Private Solar Firms

Tran, *et al.* (2020) adopted the exploratory factor analysis technique in their research on factors that influence green investment in the context of sustainable development. Among the demand side factors established in this regard include green investment infrastructure; complications in seeking credit for activities in green investment; inducements in accessing funds for investment in green investments; comprehension of investments in green enterprises; government support getting access to green investment finances; the amount of funds which green investment businesses can access; the businesses' plans to actively execute projects in green investment. Another set of factors identified in the study include awareness in green investment; awareness on green finance access; the role of mobilization tools for green capital as well as government's role.

In a desktop study, Chai (2018) analyzed the green finance mechanism and path that affect growth of the macro economy and established that investment and consumption exert a significant influence on green finance's pulling role. Zhang and Zhao (2019) adopted the panel the vector auto regression model in their empirical research on the connection between optimization of industrial structure, technology progress, and green credit and found a positive and significant connection. Reboredo and Ugolini (2020) studied in a descriptive survey, connectedness of prices between financial markets and the green bond, and determined that stock, high-yield markets for corporate bond and energy are connected weakly with green bonds. Ng (2018) further established a top-down green financing institutional legitimacy mechanism enhanced through financing that is market-based and affected by a national policy and put forth a model of incidental developments which add to a green finance system's development.

Dong and Fu (2018) established in their empirical evaluation of Heilongjiang Province, that the key drivers of green financing include regional GDP, air quality, carbon emissions, as well as the level of financial progression. The study particularly reports that these influencing factors exhibit a notable spillover effect, spatially. In another empirical study, Yu and Xu (2019) found that policies by the government have a strong influence on green financing. Similarly, Justice (2009) observed that factors such as the influence of policy and regulation and risk of return on the viability of an investment greatly affect financing of private renewable energy projects. Another study by Eyraud, Clements and Wane (2019) found that economic growth boosts investment in green projects and that some such policy interventions as "feed-in-tariffs" and carbon pricing scheme introduction significantly and positively influence green investment.

In an empirical study to examine green finance with reference to China's banking industry, Bai (2018) observes that to build Chinese financial institutions with environmental and social responsibilities, and to address the increasing environmental challenges, a policy directive was issued in 2007. The study reports that the policy has to date proved effective in limiting lending by commercial banks to high polluting and energy intensive projects in China. As a result, most banks have instituted own measures and internal policies for integrating environmental features into present practices. In addition, some financial institutions have aggressively taken up global initiatives to enhance their performance environmentally. The challenges have nevertheless remained. Finally, the study suggest that improve green financing, the banking industry in China,

in collaboration with civil society and the government, has to tackle the emerging opportunities and challenges, including by monitoring environmental footprints in international lending and improving information disclosure.

According to Shishlov *et al.* (2017), inadequate in-house capacity to develop bankable proposals is a very key demand side hindrance to development of green lending by local commercial banks in addition to lack of understanding of climate investment opportunities which limit these firms to equity financing. This is because the risk of renewable energy related projects high due to the capital-intensive nature and long term, hence require accurate estimates that provide comfort to the investors on the rate of return. According to Dhruba (2018), the front- loaded cost during early project development of most are capital intensive (up to 90 % investment on infrastructure financing during development phase). In this regard, there is need for adequate technical capacity to articulately incorporate all cost at all phases of the project and not just the earlier stages during preparation of the financial proposal/ estimates this will eliminate cost overruns or under budgeting.

Bhamidipati, *et al.* (2021) further reveal that small firms in Kenya were unable to deliver bankable proposals hence unable full advantage of the opportunities available, this is based on a study on the Kenya Solar Access Project (KOSAP), during the call of proposals for the first round of the majority of the private firms were unable to meet the quality of proposals required. Bhamidipati *et al.* (2021) notes that MSMEs in particular lack business skills in proposal writing, have limited understanding of accounts and finance hence do not articulate complex financial calculations which present a severe barrier in accessing financing from commercial banks

Shishlov *et al.* (2017) notes that technical assistance can be a great panacea for barriers for green lending on the supply-side through building of capacity. This can be in the areas of identification of investment opportunities, project appraisal and proposal writing, drafting business plans, capacity building of financial institution employees on loan application, monitoring and evaluation, marketing and communication to stimulate demand of credit with clients (Africa Clean Energy Technical Assistance Facility, 2020).

According to Kariuki and Rai (2010), the lack of the technical capacity to manage renewable energy project in Kenya has also proved to be a challenge which subsequently is transferred to the cost of operations in hiring competent and experience personnel. This capacity constraint does not only exist in the development of bankable proposals but also in the capacity of the financial institutions on renewable energy technologies. As a result, According to Kariuki and Rai, 2010), notes that the existing opportunities in the renewable energy sector are untapped.

In Kenya, International Development Assistance Programs such as the SUNREF (Sustainable Use of Natural Resources and Energy Finance) East Africa Programme funded by the AFD (Agence Française de Development), offers green line credit and technical assistance including project origination, capacity building, project bankability and awareness raising in order to increase climate financing in Kenya (Nyamongo & Nyamongo, 2019). The program has assisted several private renewable energy firms receive financing from partnered local financial institutions such as Co-operative bank, CFC Stanbic Bank, Chase Bank, through green credit lines supported by AFD.

According to Justice (2009), factors such as the influence of policy and regulation and risk of return on the viability of an investment greatly affect financing of private Renewable Energy projects. According to the Energy Financing Manual and Training Handbook (2014) by the International Renewable Energy Agency (IRENA), first point of consideration while designing financial institution support towards renewable energy is policy. This is because the type of policies and regulations in place determine the degree and level of support offered towards funding of renewable energy for instance the policy environment is able to influence the cost of capital through enabling completion as well as the cost of doing business which influences the level of profitability in an industry. In addition, clear and enforceable polices are required to deliver the project economics that attract private commercial debt and equity capital (IRENA, 2014).

Armstrong (2000) observes that within the financial sector, policies can affect access to financing through direct investment restrictions, capital adequacy rules and credit information sharing regulations. With good credit scores, one can negotiate cheaper financing and better repayment terms, monitory policies such capping of interest rates can affect supply of credit. Lack of adequate enabling policies in terms of ease of doing business, unregulated financial services sector, difficulty in obtaining licenses for registration and high start-up costs for firms impose excessive

and unnecessary burdens on private institutions and also affects access to financing (ACE TAF, 2020). In this regard, policy and regulation continue to be detriment to ensuring long term stability attraction on investment as creating an equal playing field for all players to compete.

According to Nyamongo and Nyamongo (2019), Kenya, Uganda and Tanzania have recently made headway in the renewable energy through attractive policies and regulations in an effort to uplift the private sectors capacity in supplementing electrification. In particular, Tanzania has made significant progress including de-regularization of tariffs and offering guarantees to ensure that assets are not stranded by grid expansion through avenues such as compensation, integration, or relocation. This has in turn resulted in the installation of 100 mini- grids with an installed capacity of 157.7 MW.

The study conducted literature review on the existing policies and regulations on renewable energy and financial sector and their effects on access to financing while focusing on solar energy. Globally policy interventions, incentives and regulations employed by the government including direct subsidies, tax exemptions/breaks, green bond trading, quality assurance and feed in tariffs among others have greatly improved the market segment for solar PV systems. According to ERC (2018) these interventions combined support 81% of the global PV markets. Kenya under the Paris Agreement has committed to tackling climate change through various commitments including; the National Climate Change Response Strategy 2010, National Climate Change Framework Policy, Kenya Climate Change Action Plan 2013, Least Cost Development Plan, the Climate Change Act, 2016 and the Green Economy Strategy and Implementation Plan (2016). The government has also gone further to develop additional policies such as the National Policy on Climate Finance all in an effort to reduce greenhouse gas (GHG) emissions by 30% by 2030,

2.2.1.1 Key demand side factors

The study shall focus on two demand side factors affecting financing namely the policy and regulatory environment as well as the capacity to develop technical financial proposals needed to access financing. The demand side factors examine the choice made by renewable energy firms with regard to financial services provided.

2.2.1.1 Energy Act 2019

Energy Act 2019 is the main act regulating and consolidation all energy activities in Kenya through Energy and Petroleum Regulatory Agency (Epra, 2019). The Energy Act 2019 was assented on 9th March 2019 and is an amendment to the Energy Act 2006, the Kenya Nuclear Electricity Board Order 2013 and the Geothermal Resources Act 1982. Overall, the Act is aimed at consolidating and governing renewable energy, electrical energy and downstream coal while providing the framework for formulation of energy regulations, licensing and planning including exploitation of renewable energy sources among other sources.

In this regard the Energy Act 2019 includes provisions for the establishment of the Rural Electrification and Renewable Energy Corporation (REREC) and the Renewable Energy Resource Advisory Committee (RERAC). The REREC is aimed at improving international cooperation and the promotion of renewable energy use, policy formulation and research and development whereas RERAC focuses towards allocation of renewable energy resources and licensing of renewable energy resource. The Energy Act 2019 has led to stability in the regulatory environment by providing legal, regulatory and institutional frameworks for guiding and increasing climate finance in Kenya thereby attracting investment in renewable energy in Kenya.

From the Energy Act 2019 comes regulations such as the draft Energy (Solar Photovoltaic Systems) Regulations, 2019 as well as the Energy (Solar Water Heating) Regulations 2012 which require all institutions that utilize over 100 liters of hot water per day to install and use a solar heating system and must be used to meet 60% of the premises' demand.

2.2.1.2 The Energy (Solar Photovoltaic Systems) Regulations, 2012

The existence of solar PV technologies in any countries requires a robust policy and regulatory framework. The industry is currently regulated by the Energy (Solar Photovoltaic Systems) Regulations, 2012, however draft Energy (Solar Photovoltaic Systems) Regulations, 2019 under the Energy Act 2019 have been developed pending adoption. EPRA regulates licensing of all persons involved in manufacturing, distribution, importation, sale, promotion, design or installation of any Solar Photovoltaic (PV) systems as well as in charge of adherence to the Kenya standards in manufacture, maintenance, installation and design as well as repair of Solar PV systems.

The Energy (Solar Photovoltaic Systems) Regulations, 2012 has played a key role in streamlining the solar photovoltaic industry in Kenya by creating a pool of more than seven hundred (700) licensed solar technicians and five hundred (500) registered solar companies including setting up of 5 training centers (EPRA, 2019). The regulations General Condition 7 section 3 and 4 also outline the duration taken to process applications (not later than 90 days) and validity of a license (one year form date of issue).

Based on the introduction of the draft Energy (Solar Photovoltaic Systems) Regulations, 2019 certain improvements have been made targeting the maturity of the solar PV industry in Kenya key of them including: Expansion of the extent of the works by the solar technicians by reviewing their classes: this includes introduction of a new class ST4 to capacity beyond 50 Kw including connection to the grid as well as hybrid systems. This also includes a further separation of the contractors to create new classes so as to eliminate the overlaps and confusion. Other improvements include changes to the issuance, validity and conditions for renewal or upgrade of licenses such as validity extended to 3 years from 1 year not unless requested one year from applicant, introduction of indemnity cover for contractors with a minimum of Ksh 1,000,000 to maximum of Ksh 10,000,000. In addition, the technicians will be required to have continuous professional development points (at least 30 credit points that is 10 points in every year) from experience in design, installation and commissioning, operation and maintenance of solar PV projects, attending seminars and the likes and presenting of related papers among others. All imported or manufactured solar PV systems, components and consumer devices to meet the relevant Kenya standards. Readymade solar kits will be registered by EPRA and warranty for all devices.

2.2.1.3 The Feed in Tariff Policy 2012

The Feed in Tariff (FiT) was developed in 2008 and revised in 2012 to facilitate resource mobilization in renewable energy to ensure market stability and investment security for private sector investors in electricity generation by enabling power producers to sell electricity generated at a pre-determined tariff for a given period. This enables them to operate their plants prudently and efficiently to maximize returns.

While the FiT has provided the much needed market support, it has proved beneficial only to investments aimed at grid-connection only particularly large renewable energy projects such as

geothermal, wind and hydroelectricity hence failed to cater for small emerging market segments such as solar electricity in that the policy does not accommodate generation and supply of power from a battery storage facility, neither does it accommodate hybrid structures also the policy lacks clear guidelines on PPA negotiations among other challenges.

Subsequently, according to the Technical & Economical Study for the Development of Small-Scale Grid Connected Renewable Energy in Kenya, to date there has been a rather limited response in investment as measured by the numbers of successful projects implemented under the FiT mechanism (GoK, 2012b). However, an intervention to these challenges, the GoK through the Energy Act 2019 is in the process developing subsidiary legislation to update the current FiT Policy such as the amendment of the Feed-in Tariff (FiT) Policy to establish energy auction mechanism for the solar and wind energy markets in Kenya so as to promote competitive bidding and thereafter promote cost effectiveness.

2.2.1.4 The National Policy on Climate Finance 2016

Although Kenya has made tremendous strides in establishing financing frameworks for climate change such as the Green Climate Fund (GCF), Global Environment Facility (GEF) as well as prioritization of domestic sources of climate finance such as national budget allocations and private investments, green financing still poses a challenge in Kenya particularly within the private sector (GoK., 2021).

GoK (2016b) outlines strategies on ways of attracting investment in green technologies and investment's through identifying fiscal incentives as potential drivers of green technology for investors and SMEs. The policy describes the institutional, legal and guiding frameworks to access and management of climate finance from both domestic and international sources, in line with the institutional structures and framework set out in the legal framework governing climate change (GoK, 2016a). The policy in addition to describing the strategic policy interventions the Kenyan government intends to make with respect to climate financing, includes plans for mobilization of climate finance and increase financial flows including the establishment of a National Climate Change Fund with an independent secretariat supervised by the National Treasury under the Public Finance Management Act, 2012. The fund is aimed at supporting the tracking, mobilization and coordination of climate finance in Kenya including both domestic and international resources.

The National Treasury and Planning has been mandated to implement his policy. According to Bhandary *et al*. (2021) climate finance policies are generally not used in isolation. In Kenya the policy can be said to have be attributed the mobilization of climate finance through initiatives such as the green bond programme between CBK, CMA and NSE as well as increase in budgetary allocation towards climate change initiatives in Kenya this includes decentralizing of funds to the County governments through the County Climate Change Fund (CCCF) which includes climate legislation enacted by county governments that focus on climate projects identified by local communities and supported by entities such as the Global Climate Finance, National Climate Fund, National Treasury & County Budgets as well as donors. In addition, according to the Landscape of Climate Finance report Kenya (GoK, 2021) in 2018 USD 2.4 billion of public and private capital, 34.4 % being from the private sector was invested in climate-related activities.

2.2.1.5 Kenya's Value Added Tax (Amendment) Bill, 2014

On 29th May 2014, the VAT amendment Act 2014 came into place to include an expanded list of goods and services that are exempt from VAT. This included the zero-rating import duty and exemption from value added tax (VAT) for energy-specific equipment with the aim of growing the sector. This includes equipment, materials and accessories imported or bought for the construction of power generating plants. This included specialized solar equipment and accessories such as solar water heaters and deep cycle-sealed batteries which exclusively store solar power. For instance, equipment's such as hydraulic turbines and water wheels are free from import duty but pay 16% VAT. On the other hand, already assembled devices that is PV cells and wind powered generating sets are only subject to a 5% import duty and 16% VAT.

In Kenya, changes to VAT laws regarding solar products have experience a progressive and retrogressive trend over the years such that in 2009 the GoK zero rated solar products, however in 2013 the government shortly reintroduced taxation on these products at 16% in a bid to increase revenue but later dismissed this tax in an attempt to increase investment of renewables in Kenya.

2.2.1.6 The Finance Act 2020

On 23 June 2020, the National Assembly passed the revised 2020 Finance Act for introduction of a 14% Value Added Tax (VAT) on off-grid solar products, this bill revoked existing VAT exemptions for specialized solar equipment's on development and generation of solar power and

wind energy such as deep cycle batteries. With this in mind the cost of VAT for this equipment will go up to the current 14% VAT which is likely to drive up the cost for solar and wing equipment and subsequent cost of doing business and further prohibiting access to renewable energy do to the costs involved.

A deep analysis of the regulations revealed that some of the key issues affecting the solar PV market in Kenya include proliferation of counterfeit PV products as well as poor PV installations in to the Kenyan market. This is due to failure to identify the specific standards by the licensees in terms of production or import of standard photovoltaic. This can mainly be attributed to poor regulation and monitoring of solar PV products by the Energy & Petroleum Regulatory Agency. However, the government in an effort to mitigate these challenges has developed on-going renewable energy related draft energy regulations including the draft energy (solar photovoltaic systems) regulations 2019. The draft regulations are aimed at dealing with these regulatory shortcomings as well are review of the technician classifications and licensing fees for both technicians and solar PV system contractors and warranties for the solar equipment's, and conformance to International Electro technical Commission Technical Standard IEC/TS 62548 2013 among others.

Regulatory instruments have been particularly focused on the promotion of external investment to the generation of energy in the public sector at the expense the private sector, however private sector participation is not only necessary buy key to reducing the infrastructure investment gap but, given the right framework and incentives, the private sector can drive development of renewable energy of African economies. This particularly applies to the Kenyan market that is flooded with investment opportunities in the public sector while very limited on the private sector. For instance, the Energy policies have provided interventions geared towards the development of the PV market in Kenya, however they have eluded financing of the private market with focus mainly being through multilateral development partners and grants to public institutions with very limited support towards facilitation of the specified financing and investment to the private sector and PV consumers**.** For the PV markets in Kenya, various financing mechanisms have been used to support PV markets including grants and subsidies, equity, debt and asset financing models. In Kenya, the *Mkopa* Pay as You Go and *Azuri* financing model have provided asset financing to under banked customers.

2.2.1.7 Regulatory Documentation Prior to Licensing

According to literature review conducted. The researcher noted that requirements for licenses differ with the type of renewable energy ventured into investors in geothermal energy for instance one must obtain twelve (12) clearances while those in solar need only ten (10), wind energy investors on the other hand are obliged to obtain a clearance from the Kenya Civil Aviation Authority (KCAA) to ensure high structures do not interfere with air traffic. In addition, clearances from the respective County Governments vary.

In Kenya the existing energy policy and legislations are supportive of mini-grids and do not give exclusivity to any single distributor. The solar mini-grids vary in sizes, sophistication and operation. In the private-sector-owned projects, electricity for purposes of generation, distribution and supply are typically below 50 kW with regulation and licensing for generation of capacities under EPRA. In addition to licensing, prior to construction and installation these firms also require approval from the National Environmental Management Authority (NEMA) for the Environmental and Social Impact Assessment (ESIA) license.

According to the (German Climate and Technology Initiative, 2015) some of the documents to be presented to EPRA as required by Energy Act, 2006, and the Energy (Electricity Licensing) Rules, 2010 for approval include the following: three (3) hard copies of application forms and one digital copy; application fee of Ksh 10, 000. (Above 3 MW or) and Ksh 5000 (below 3MW); three year financially audited accounts; a project report by a competent engineer; NEMA license/permit (Environmental and Social Impact Assessment); a proposal and map showing location of the project; letter to the local county government providing notice of the project; copy of the Kenya Gazette and/or newspaper advertisements giving notice of application; application for tariff and other charges the project will levy on the consumers. Which should include the financial model used to arrive at the tariff.

In addition to an electricity generation license from EPRA, the following regulatory requirements are needed in order to construct electricity generation plant in Kenya for purposes of import or export, transmit or distribute electrical energy exceeding 1MW. An electricity generation license, and the following permits when constructing an electricity generation plant: permits from the Kenya National Construction Authority (NCA) i.e. Registration of both the contractors and the project; permits from the National Environment Management Authority (NEMA) i.e. (1) the

Environmental Impact Assessment (EIA) license (2) noise and/or vibrations permit; (3) import/export license for controlled substance and prior informed consent document (4) Annual license for waste treatment or disposal site; permit from EPRA: Electrical installation license for all persons who intend to carry out electrical installation work under the Electric Power (Electrical Installation Work) Rules 2006; permits from the county government: that is Annual single business permit, fire clearance certificate, development permissions and building plans approvals. Other key permits include: valid annual practicing license for engineering work; Certification from the Kenya Bureau of Standards (KEBS) and Pre-Export Verification of Conformity Programme (PVOC) Inspection for goods and equipment imported into Kenya, issued at the port of origin, unless exempted; approval for the height of any structure from the Civil Aviation Authority; and the project site must be registered as a workplace by the Director of Occupational Safety and Health (Occupational Safety and Health Act 2007).

2.2.1.2 Supply Side Finance Factors and Financing of Private Solar Firms

Gulyamova (2020) studied in a descriptive survey, the role of green financing as a financial support mechanism for investment activities with a view to ensure sustainable and balanced growth in Russia. The study reports that in the Russian economy, notable levels of investment can be adopted by an adequate method that not only implies investment in production of high-tech processes and solutions, but also an adequate mechanism of financing which can channel both financing technologies and external and internal financial resources to "green" projects. In another study, Baumli and Jamasb (2020) established in their empirical research factors such as access to finance among others directly determine the levels of domestic spending on infrastructure projects.

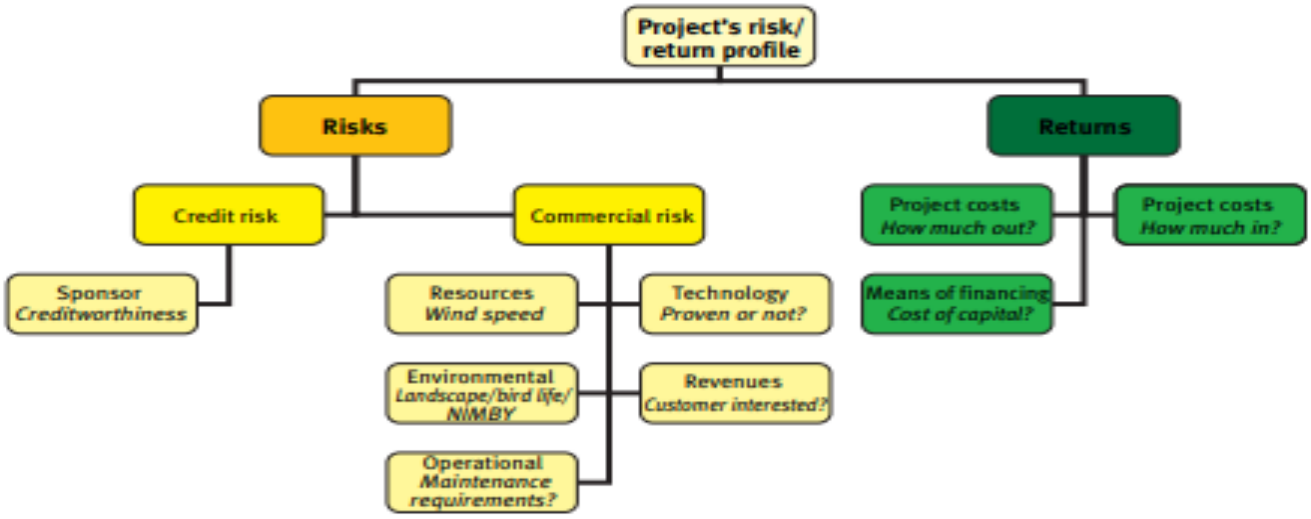
Craig (2016) established in their study that access to finance is impacted greatly by both demand side and supply side factors and their contribution to both financial inclusion and exclusion. According to Shishlov *et al*, (2017) demand and supply side hindrances to green lending by local financial institutions include: limited understanding of climate investment opportunities including prevailing business practices and in adequate in-house capacity to develop sound proof investment proposal.

In renewable energy projects, the risk of return is critical because it is a highly volatile industry where the cost of clean energy is dependent on the cost of capital (Fatoki, 2012). It is further dependent on the credit risk perception of investors. According to Ashaye and Alharahsheh,

(2019), financial institutions in Africa analyze both the risks and returns of the project with an aim to create a financial product for renewables that includes, repayment schedule, the repayment terms, the interest rate and any guarantees or securities. The analysis includes a review of the creditworthiness of all parties involved that is credit score, the business plan, stability of the policy and regulatory environment, projected cash flows, interest margins, Internal Rate of Return (IRR) and the Net Present Value NPV), reliability of and cost of technology involved, permits and environmental approval necessary as well as company historical data. All these create a disincentive for private firms to seek financing from local financial institutions.

In any circumstance, financiers want to make returns proportional to the risks undertaken. Ashaye and Alharahsheh, (2019) samples the following (Figure 2.2) methodology used by financial institutions in analysis of risk and returns for financing of a wind project. Based on the model below risk quantification goes beyond review of the internal business environment of credit worthiness to external factors such as commercial risk in the industry, environmental risks, technology among others whereas the returns are quantified based on the firms' capability to quantify exact project cost including capital cost.

Figure 2.1: Methodology of Analyzing Risk and Return



Source: Ashaye and Alharahsheh, (2019)

Gitman and Chad (2020) argue that commercial banks impute high risks to small enterprises due to their high-risk profiles associated with factors such as uncertain competitive environment; inadequate accounting systems; non-registration of assets, delay in payments of products and

services, and strains in human and financial resources. In particular, they are mostly reluctant to provide financing to private firms due to lack of securities as collateral since they are perceives as a highly risky and undeserving of any credit even though the private owners save with these banks (Okoth, 2013). In addition, commercial banks use credit scoring to evaluate the risk profile of the private firms applying for finance. However due to the lack of insufficient credit sharing information platforms, they rely more on relationship lending or avoid the risks entirely.

According to Huang *et al.* (2010), financing risk is a management activity that takes the initiative to create conditions to do the utmost to avoid or reduce the deviation between actual benefits and anticipated benefits. Unfortunately, financial institutions have set up standardized risk assessment criteria in reviewing loan applicants due to inadequate information clearly distinguish between good and bad borrowers. In addition, Energy for impact Annual Review 2016 report, states that local banks are mainly risk averse and make decisions with limited knowledge of businesses and cash flow trends Financial Sector Deepening (FSD), 2015). In return, unattainable conditions are set that excludes these firms from accessing finances. This is mostly through charging higher interest rates as well as impose stricter and many lending conditions, which include but not limited to asking them to provide all documentation making it nearly impossible for the small entrepreneur to access the loan facility (Kimaiyo, 2016). For developing countries such as Kenya, the risks are higher since these countries mostly rely on technological advancement from developed countries (Nyamongo & Nyamongo, 2019).

According to (Gangata & Matavire, 2013), very few private firms, especially SMEs, succeed in accessing funding from financial institutions. This is mainly because of failure to meet stringent lending requirements by financial institutions. Some of these requirements include provision of audited statements dating three- five years prior, business financial records including bank statements, registration and compliance certificates, license and key among them being provision of collateral security (Gangata & Matavire, 2013).

Dhruba (2018) also notes that credit risk assessment and credit rating significantly influence the cost of finance for renewable energy projects, lack of which results in mispricing of risk and poor allocation of capital. However most financial institutions relay on collateral or availability of alternative cash flows as mitigate risk instead of using more viable credit risk assessment tools, hence the benefit of investing in the renewable energy sector eludes many enterprises including

those with bankable projects. According to Mulei & Bokea (2000), most banks that provide credit require 100% collateral as a risk mitigation measure. While reviewing credit applications, financial institutions need to further consider calculation of unit costs of installation within the country to determine the portfolio size hence informing the cost of financing. This information can help offload the amount of documentation needed by financial institutions during loan applications.

According to Karekezi and Turyareeba, (1995) commercial banks create unfavorable demand on renewable energy technologies aimed at discouraging borrowing such as insistence on a feasibility study at the borrowers' cost, they also request for collateral, information on past projects, portfolio of directors and sponsors, valuation reports, procurement and marketing plans and an estimate value of existing investment among others. In Kenyan, the key business requirements needed to access financing from Local financial institutions include documents such as Business Plan, Credit History, Company Profile Information, Financial Statements, Collateral and company Cash Flow among others depending of the financial institution approached.

2.2.3 Financing Challenges and Financing of Private Solar Firms

Falcone and Sica (2019) conducted a discourse analysis aimed at providing empirical indication of the challenges and opportunities that surround green finance with a focus on the financial barriers in green companies' investment decisions with reference to producers of Italian biomass. Findings indicate that green finance offers an occasion to realize innovation pathways that are environmentally sustainable. It was however found that experts note this fails to actually prevent producers of biomass from facing financial and institutional criticalities in financing their investments. Among these criticalities include: unstable government policies, limited involvement of financiers in supply of biomass production poor knowledge of technical skills within firms and financing options available. The findings further show that adequate policy interventions ought to ensure that the long term goals are aligned towards lessening perceived risks by financial institutions in financing producers of biomass.

Gitone (2014) noted in their study that one of the key obstacles to undertaking renewable energy projects is the absence of low cost and long-term funding. Gitone (2014) notes that, for countries with unfavorable or unstable macro-economic environment, financial institutions put in place strict lending terms because of their limited knowledge on the imported technologies which becomes a disincentive for potential renewable energy investors. The World Bank (2008) also classified

barriers to financial access to four main categories that is insufficient documentation, affordability barriers, physical barriers and lack of appropriate products and services.

Megumi, Caguioa and Alterescu (2020) argue that developed countries have the technological capacity and sound funding mechanisms to engage in renewable energy. However, in developing countries, high poverty levels, ever increasing population and limited technological advancement limit the growth of investment in clean energy technologies. In most developing counties, the cost of clean energy is dependent on capital cost which relies on the credit ratings, which in turn influences both pricing and capital allocation. In addition, Dhruba (2018) notes that emerging economies face greater challenges in accessing credit since the credit is limited and expensive while foreign funds include currency hedging costs thereby increasing the cost of finance.

The main challenges in implementation of private renewable energy projects in Sub–Saharan Africa include; lack of relevant information on regulations, markets and resource availability, and lack of financing and experience in developing bankable project thereby making it difficult for investors to identify attractive projects (Megumi, Caguioa and Alterescu (2020)). As a result, financial institutions avoid financing renewable energy projects (financial de-risking) hence reducing available capital for bankable projects. In addition, Kariuki and Rai (2010) notes that in East Africa most commercial bank do not provide specific energy financing products but lend as part of the range of working capital and asset finance products which in turn has led to limitations in reaching the full market potential for the renewable energy sector despite the abundance of Resources. Megumi, Caguioa and Alterescu (2020) further notes that commercial banks in Kenya cannot access affordable capital to lend to borrowers whose overhead costs are high. Therefore, they provide less favorable financing conditions to the private energy sector.

According to Donastrog and Suresh, (2017), the financial challenges faced by many developing countries is huge since engagement with them is a necessity rather than an option hence explaining the rational choice theory. Donastrog and Suresh., (2017) also suggest the need for a strong financial sector and political framework that incorporate the private sector in renewable energy projects as well as addressing the perceived risks.

In addition to this, the market also experiences challenges of consumer unawareness especially considering that the market is relies heavily of every changing technological advancement; also, the quality product assurance, supply networks and technical maintenance which greatly affect the

risk portfolio analysis process hence driving up the cost of finance. For instance, according to a survey done by Kariuki and Rai in 2010 a financial institution offered solar PV loans for a solar lantern of KES 6,000.00 with a load repayment duration of 6 months repayable, bi-monthly at an interest rate of 10% flat rate, the solar lantern retail cash price was KES 2,500.00 (Kariuki and Rai, 2010)

2.2.4 Financing Opportunities and Financing of Private Solar Firms

Cui (2017) conducted an empirical study aimed at exploring green finance in China, from the perspective of Chinese banks which offer such credit. The study's goal was to confirm if in practice, green loans offer more business opportunities and better risk management. Sampling 24 banks in China from the year 2009 to 2015, the study used a panel design containing green finance and financial data. To evaluate if the financial institutions' practices in green finance led to improved financial performance, the study used such Panel regression approaches as random-effect panel regression and two-stage least square regression analysis (2sls). The study findings showed that green credit increased at a faster rate compared to other loan types and that assigning higher credit to the overall loan portfolio decreases a financial institution's bank ratio of non-performing loans. The results suggest that with increasing demand, green financing is a less risky venture.

Forcella, Castellani and Huybrechs (2017) analyzed green opportunities in microfinance lending in the Caribbean and Latin America. The study observes that including environmental standards in credit products among microfinance institutions with a view to encourage access to more efficient or clean energy use, sustainable activities or decreasing environmental and climatic risk for microenterprises or low-income households is a growing and dynamic market in the Caribbean and Latin America, with forthcoming and existing opportunities. However, institutional buy-in, clear strategies and client outreach are still low. Appropriate tools and better coordination, strategies and products ought to be developed to realize the possibility of a thriving green microfinance industry in the Caribbean and Latin America. According to Gitau (2012), with access to affordable financing, local businesses are able to, grow, reduce risks, facilitate market entry and achieve innovation as well as exploit growth and investment opportunities. Improving access to financing then implies availability of affordable financial services to all.

According to IRENA (2019), within the last 10 years, the cost of renewable energy technologies has greatly declined due to the increase demand for clean energy as a result of the increasing challenges faced due to climate change. While the initial capital of infrastructure for setting up renewable energy sources is expensive, it is slowly becoming comparable to fossil fuels in pricing and is continuing to fall year by year. Solar electricity in particular is falling by 13% annually.

In addition, Wakaba and Wepukhulu (2019) observe that the tremendous growth of the Mobile Money industry in Kenya has significantly improved the financial services sector in Kenya, thereby significantly improving the level of financial inclusion currently at 83% in 2019 according to the FinAccess report 2019. This rate of inclusion has enabled private companies providing renewable energy products and services to apply the pay-as-you-go model which enables monthly repayments instead of the full upfront investment hence increasing their clientele.

In recent years the private sector renewable energy market in developing countries have been benefiting from results-based financing (RBF) scheme incentive payments for low-carbon off-grid energy. RBF is whereby where Payments are made against pre-specified results which are to be achieved. In Kenya RBF has been in existence since 2014 with companies such as EnDev Kenya implementing projects such as solar-hybrid mini-grids. Its existence has provided an incentive to financial institutions to promote financial schemes thus creating a buffer against market failures constraining the private sector as well as driving affordable credit lines for small business owned solar systems in rural areas in Kenya as well as promoting commercial debt financing based on assurance of existing of RBF mechanism based as a guarantee (Wakaba & Wepukhulu, 2019).

In the recent years green credit lines have also been introduced as a way to bridge the gap of increasing demand for financing of renewable energy. This has been done through injection of financing through local financial institutions targeting commercially viable and impactful small scale renewable energy projects. In addition, according to the Clean Energy Financing Demand Market Report (2019), within the solar home system (SHS) market, due the vibrant technological advancement innovations such as the Pay-as-you go (PAYG) solutions and smart metering have been widely adopted throughout the sector) (EEP Africa, 2019)

2.3 Research gaps

Through literature review the study revealed gaps in academic studies exploring challenges in accessing financing for Renewable energy in Kenya as follows: Mulandi (2013) focused on factors

influencing access to credit in the renewable energy sector with a case study of biogas however, Mulandi only reviews the internal factor within a firm that limits access such age of the firm, capital invested, size of the business, financial records and access to information among others are what affect access to credit.

Oruoch, (2015) focused on stand-alone solar power with a focus on the financial in Sub-Saharan Africa while focusing on payment options including mode of payment, the cost of the solar lighting systems among others. The study however has no specific focus on the source of financing and the players involved. Gataru, (2019) explored financing renewable energy technologies with a focus only on end users as well as the strategic partnerships between Financial Institutions and Energy Service Companies and their effects on the increase in the uptake of solar credit.

2.4 Theoretical Framework of the Study

2.4.1 Rational Choice Theory

The theory developed by neo-classical economist, Adam Smith in 1976 in his book, "*An Inquiry into the Nature and Causes of the Wealth of Nations*". The theory states that individual use self-interest to make the choices that give them the greatest benefit. The theory can be used to provide an understanding of how individuals as well as institutions' behavior in determining the best alternatives for them.

According to Awunyo, (2018), the rational theory can be used to describe the demand for financial services that is the desire for financial service, the nature of the service provided by financial institutions and the conditions for providing the services. According to Awuoyo (2018), these factors influence the choice of service sought by financial services. This is based on the assumption that institutions make the choice that will best help them achieve their objectives in light of several uncontrollable factors hence can be used as a cost benefit analysis mechanism to choose the best or most favorable outcome. The theory has however been criticized due to the fact that assumptions made fail to take account of the fact that the successful outcome of the 'best choice' is also influenced by other factors out of the control of the decision maker, this the theory has best described how economic decisions are affected by their attributes.

In this regard, the theory can be used to explain challenges in accessing financial services both from the demand and supply side from financial institutions much so within the renewable energy

sector. For instance, the choice of renewable energy firms to seek debt financing is influence by a combination of factors such as cost of credit as well as the lending restrictions or repayment terms put in place hence a firm can seek an alternative of utilizing cash-flows or seeking equity financing such as parent company support as is the case by most renewable energy firms

2.4.2 Financial Inclusion Theories

Financial inclusion is defined as the availability of, and the ease of access to, affordable and fair financial services and products to all. The theory notes that all business with a need for financial services in order to meet business needs should be able to access the services easily and affordably failure of which denotes financial exclusion. Financial inclusion can be voluntary or involuntary however, all who voluntarily need the services should be able to access them when desired. Ozili (2020), urges that the current state and practice of financial inclusion in modern day financial sector lack a theoretical underpinning that provides a deeper understanding and realization of the set goals. Further, Ozili urges for three sets of financial inclusion theories as follows: theories of financial inclusion beneficiary which answers the question who is the real beneficiary to be targeted by particular financial inclusion programs; theories of financial inclusion delivery- this theory endeavors to answer the question as to whom between government and private sector should play the key role in delivering the financial inclusion goal to the people; and theories of financial inclusion funding- these theory tries to answer the question of where between public money and capital markets the funding for the realization of financial inclusion should come from.

The financial inclusion theory is relevant to the study based on studies by Kimaiyo (2016) which notes that strict lending is used by financial institutions as a de-risking mechanism (UNDP, 2011) hence targeting their borrowers. On the other hand, renewable energy firm's failure to meet the lending regulations including submission of all required documentation and bankable proposals automatically leads to financing exclusion. According to (Beck *et al.,* (2006), access to finance is impacted greatly by both demand side and supply side factors and their contribution to both financial inclusion and exclusion. Private firms who are excluded miss out on growth and investment opportunities' due to lack of access to credit.

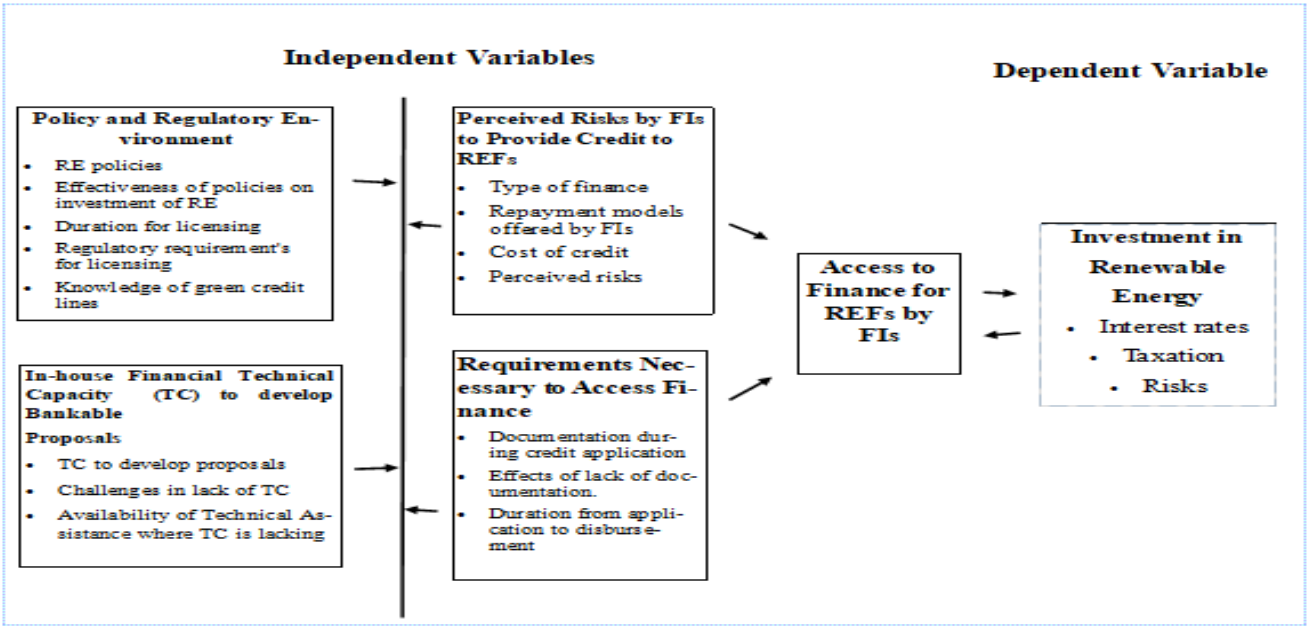
2.5 Conceptual Framework

The level of investment in renewable energy is determined by both demand side and supply side factors combined or independently. The policy and regulatory environment and availability of

technical capacity to develop bankable proposals both influence the demand for credit as well as the willingness of financial institutions to give credit e.g. policy affects cost of doing business (taxation) as well as the cost of borrowing (interest rate) which affects profits which in turn attracts demand for investments, on the other hand policy directly affects investment levels and indirectly (risks) transferred to borrowers by the business environment. The in-house capacity to develop bankable proposals as well as the requirements necessary during credit application directly negatively affects access to financing and investment levels through the effects of de-risking or financial exclusion.

In this regard, the increase in the willingness of renewable energy firms to seek credit combined with the increase in the willingness of financial institutions to provide financing directly increases investment in renewable energy

Figure 2.2: Conceptual Framework in Financing of Renewable Energy Projects



Source: Researcher 2021

2.6 Other Authors' Related Works

Different studies have been conducted on this topic and their findings have an impact on this research. Donastorg *et al*. (2017), also conducted research on financing of renewables in developing countries while indicating major financing obstacle for renewable energy projects. The study suggested that different internal and external sources of funding be utilized in supporting the

available renewable energy projects in Kenya. The UNDP, (2013) provided a report the need for public support to private investment for the development of renewable energy projects. One focus was the available financing opportunities that private organizations could use to fund their projects. Recommendations include deepening local financial intermediation and co-investing to leverage private finance.

Bhattacharyya and Palit (2016) conducted a study on the policies required for mini-grid based off-grid electrification programs to be effective. The findings of the study indicated that effective financial policies have not been put in place and that it will remain a key problem in the next ten years. The study concludes by giving ten policy recommendations for solving this problem. The UNDP (2019) report on increasing private capital investment into energy access can help in meeting the objectives of this study. The report mainly focuses on mini-grid pooling facilities. The findings of the study indicates that private capital investment in these projects has been low as a result of the fear of the associated risks. Also, standalone financiers are discouraged by the project costs.

Vulturius and Tuhkanen (2020) conducted a study on the need to expand financing for private off-grid solar projects. The study is based on the idea that the financing of these projects will play a critical role in achieving the SDG7 by 2030. The findings indicated that funding has been prevented by a focus on large projects, and lack of guidance for underdeveloped organizations hence recommended use of blended finance, bonds, and carbon markets to increase funding for the private sector. The World Bank Group (2017) report focused on regional off-grid electrification projects. Specifically, the report focuses on the assessment of the private sector support in the market. The report indicated many challenges in funding the private sector in Africa. The report talks about the importance of providing funding from different sources.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of the research methodology chapter is to explain the research design, target population, sample size and procedures, study instruments, the data types as well as the data analysis.

3.2 The Study Area

Nairobi is Kenya's capital and covers an area of 696 square km^2 and extends between latitude of 1.2921° S and longitude 36.8219° E with a population of 4.397 million according to the 2019 Kenya Population and Housing Census (KPHC). In particular, the study shall focus on financial institutions and solar renewable energy operational within Nairobi County as it is the Kenyan Capital and where most of the company headquarters are based.

3.3 Research Design

The study adopted both the descriptive and cross-sectional research designs. Maxwell and Miltapalli (2010) posits that the descriptive study design seeks answers to the investigations of what, who, when, how and where, associated with a particular study issue and articulates a phenomenon, population, event or their association. The design is pertinent to this study because it sought to articulate how the study variables, that is demand side finance factors, supply side finance factors, financing challenges and financing opportunities, manifest among the respondent organizations. The design is also relevant as it describes the associations between the outcome and variables. The design was further deemed appropriate in the present study, as the study utilized survey tools, including a structured questionnaire and key informant interviews. Saunders et al. (2015) state that cross-sectional design at a point in time can measure differences among a variety of individuals, subjects, or phenomenon instead of progressive time series. The cross-sectional research design was therefore deemed appropriate in the present research as the research collected data at one point in time.

3.4 Target Population

According to secondary data from the Kenya renewable energy association (KEREA) there in estimated 66 registered Private renewable energy firms in Kenya in the solar, wind, geothermal, hydro and biomass sectors (Annexed). While some of these firms engage in two or more forms of renewable energy, majority (41) of these firms engage in solar energy offering commercial and household stand-alone PV systems as off-grid power solutions. (Annex 4). Under renewable energy firms there are several classifications of solar energy projects mainly (a) utility scale that produce >5MW, (b) commercial & industrial (C&I) that produce between 20 KW – 5 MW, (c) mini-grids that produce between 10 – 500 KW and (d) distributors that assemble and install residential solar equipment.

In addition, as at December 31, 2020, the Kenyan Banking sector comprised of 42 banking institutions (41 commercial banks and 1 mortgage finance company), 9 representative offices of foreign banks, 14 Microfinance Banks (MFBs), 3 Credit Reference Bureaus (CRBs), 17 Money Remittance Providers (MRPs), 8 nonoperation bank holding companies, 1 Mortgage Refinance Company and 66 foreign exchange (forex) bureaus. (CBK Bank Supervision Annual Report 2020) (Annex 5). The study target population however comprised of both the 41 private solar energy firms and 41 commercial banks in Kenya, bringing the total target population to 82.

3.5 Research Procedure

The research process began by the identification and the development of a research topic that paved way for further investigation on the existing gaps available. This was followed by review of the existing empirical and theoretical literature that helped in the development of a theoretical and conceptual framework that was used in the study. With this research components in place the research questions and research objectives were formulated. Which led to the determination of research design and research methodology these involved the development of data collection tools. The researcher further sought clearance from the Department of Geography and Environmental Studies of the University of Nairobi and permit from the National Commission for Science, Technology and Innovation (NACOSTI).

The research process started with extensive literature review and analysis from Government reports, press releases, websites and stakeholder reports on the various policies related to renewable energy as well as those within the financial sector that relate to access to financing. The

review targeted the policies, changes if any and the documented challenges and gaps present. The process of collecting and analyzing the literature started in May 2020. These sources provided a basis for understanding the history of renewable energy related policies, and the overall performance of the policies in addition to those within the financial sector. The available research was used in combination with the collected primary data to conduct a cross review of the sector, some of the existing challenges as opportunities so as to draw up conclusions for the study.

3.6 Sampling Procedures and Sampling Size

3.6.1 Sampling Procedure

The study adopted a mix of both probability and non-probability sampling techniques. Under probability sampling, the study targeted 82 firms owing to the relatively manageable size. Under non-probability sampling techniques, the study adopted purposive sampling to select key informants who comprised of 4 commercial banks that provide green lending and 3 renewable energy firms that have previously benefitted from green funding. One (1) key informant from each of the 7 firms was selected from a relevant senior management cadre. According to Palinkas, Horwitz, & Hoagwood (2016), purposive sampling has been adopted in most qualitative research studies in the identification and selection based on the knowledge of the sampled groups with an aim of getting information-rich cases. Purposive sampling is used to target a set of the population, particularly when you want to access a specific type of information from specific respondents who have specific characteristics. During the study, while the researcher targeted adequate representation for the study population for both the renewable energy firms and financial institutions, the researcher purposively focused on key informants who provided information rich cases relevant to the study.

3.6.2 Sampling Size

Sample size is a representation of the target population. Cooper & Schindler (2014) note that samples are crucial in ensuring adequate representative of the entire population. According to Mugenda & Mugenda (2003), if the study population is less than 10,000, a sample size of between 10-30% is a good representation of the target population. As such, owing to the relatively small population all 82 target firms were targeted for maximum representation. In this regard, the units of observation were the 82 firms, while the units of analysis were senior finance officers for private solar energy firms and senior credit officers for Commercial Banks.

3.7 Data Types

The study relied on two data types: Primary data and secondary data.

3.7.1 Primary Data

The study made use of primary data which was both quantitative and qualitative in nature. While quantitative data was collected using a structured questionnaire, qualitative data was collected using a key informant interview guide. The primary data collected included; on the demand side, effectiveness of the policy environment, knowledge of green credit lines, availability of technical capacity to develop bankable proposals, challenges where technical capacity is lacking, provision of technical assistance by financial institutions where technical capacity is lacking. On the supply side; types of financing sought, common repayment models, cost of credit and perceived risks, required documentation, effects of lack of adequate documentation and average duration from application to disbursement.

3.7.2 Secondary Data

Secondary data is data that has already been collected and is readily available from different sources. Secondary data used in the study was collected from academic papers, historical records, statistical databases and government publications sourced from internet government agencies and library. The data was analyzed using document analysis. The secondary data collected included: desk analysis of renewable energy policies in Kenya as well as those that directly affect financing; average duration from application to acquiring licensing, regulatory requirements necessary for licensing, cost of credit, requirement's during credit application.

The effectiveness of the secondary sources was evaluated using factors such as relevance, accuracy, availability, and sufficiency (Irwin, 2013). Secondary data allowed in-depth understanding of the problem as well as a comparative analysis of the study findings with other studies. Secondary data collected included desk research on policy and regulatory environments with the RE sector, the list of all requirements necessary for licensing and credit application, the list of all licensed commercial banks by the CBK and list of licensed Renewable Energy Firms by Kenya Association of Manufacturers and Kenya Renewable Energy Association among others.

3.8 Study Instrument

The study made use of both a structured questionnaire to collect quantitative data, and a key informant interview guide to collect qualitative data. According to Graveter and Forzano (2003),

the questionnaire is deemed desirable as it allows the acquisition of data from a sample size that is large in a manner that is economical and because it also allows for the use of both quantitative and qualitative techniques of data analysis. According to (Hesse-Biber, 2011) interviews allows one on one interaction with respondents hence allowing the freedom to talk about what is of interest or importance to them regarding the study as well as flexibility in the interviewing process. The researcher was able to dig deeper in search of critical comments and insights on the study based while taking notes of the key informants' response hence allowing for access to rich in-depth information from Managers and Senior Loan Officers within the financial institutions and management level or finance managers from renewable energy firms all whom have adequate experience in seeking or providing access to financing. The questionnaires were administered on a 'drop and pick' approach where participants were allowed ample time respond and return dully filled questionnaires while interviews were conducted for an average duration of 40 minutes (Transcribe annexed).

The data collection instruments were pre-tested in a pilot study to check for reliability and validity, as well as clarify any anomalies that may cause misrepresentation among the respondents as well as identify a flow of the questions while avoiding repetitions and questions that would lead to biasness. The key informant interviews were administered from 13th August to 15th October 2020. The interview guide was to be one-on-one sit down, however during the period of data collection, the Covid-19 pandemic was heightened hence getting personal interviews was a challenge. In this regard the interviewer opted for zoom and phone recordings which also provided for flexibility to the interviewers as well as ample time for deeper discussions, however there were disruption due to the fact that most of the key informants were working from home hence one respondent could have more than one recording. Questionnaires were strategically administered for the 82 target firms.

3.9 Validity and Reliability of Data Collected

Reliability is the degree to which based on repeated trials a particular measuring procedure gives similar results whereas validity is the degree to which results obtained from analysis represents study phenomena that is appropriateness or meaningfulness to the study. The researcher, in an attempt to test the validity and reliability used the following procedures. For reliability, the researcher tested the instruments with a pilot interview, refined the questions and then re-tested to the same correspondent in order to ensure internal consistency of the interview guide. In testing

validity, the researcher used triangulation by using both interview guide and structured questionnaire's for both renewable energy firms and financial institutions so as to cross analyze findings with the secondary data collected. Barbour (1998) supports triangulation in qualitative research. The instruments were also shared with the thesis supervisors for their input.

3.10 Ethical Considerations

The study was conducted in consideration of ethical confidentiality and integrity while considering the fact that the study was purely academic, Consent was sought from the respondent's before recording of key informant interviews as well as the structured questionnaires. Prior to data collection the researcher sought both a study permit and student clearance. In addition, the data collected during the period of this study will be treated in confidence especially for the key informant who insisted on animosity

3.11 Data Analysis Methods

Employing a mixed-method approach, data was analyzed by both quantitative and qualitative data analysis techniques. Quantitative analysis comprised both descriptive and inferential statistics. Descriptive analysis involved frequency counts, percentages, and means while inferential statistics were analyzed using both Pearson correlation and regression analyses. The regression analysis was utilized to establish the association between the predictor and outcome variables and subsequently test the study hypotheses. Anova test was also used to test the significance of the results. In this regard, the study used the following regression model:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Y = Access to Green Energy Financing

$\beta 0$ is constant and representing Y when X_1-$X_4 = 0$.

β_1- β_4 represent the regression co-efficient which measures the average change in the dependent variable

X_1 = Demand Side Finance Factors

X_2 = Supply Side Finance Factors

X_3 = Financing Challenges

X_4 = Financing Opportunities

ε = Error term

The qualitative data from both primary and secondary data was on the other hand analyzed through thematic content analysis. According to O'leary, (2004), content analysis is used to collects review, interrogation and analysis data gathered from in surveys, interviews and observations. (Schnepf & Groeben, 2019) further argue that using qualitative content analysis interpretation in case study research guarantee that the whole empirical basis is systematically dealt with and that the analysis is reproducible into information that can be used to draw conclusions.

The study used qualitative (document) content analysis for the secondary data by using the following steps: develop codes for the research questions. For instance, on the demand side key codes such as policy, requirements, technical capacity were used. The screening process was then conducted to identify the codes within the transcript responses. The researcher then went ahead to verify or validate the codes schemes while checking for accuracy and then categorizing them, this assisted in identifying relationships between the variables (demand and supply side factors and access to financing). There after using cross referenced or comparative literature review so as to draw conclusions.

The limitation of content analysis during the study was that it led to a challenge is drawing conclusions as well as considered subjective and can sometimes lead to questioning of the validity of the data.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The study set out to investigate access to green energy financing for solar power projects within the private sector from local financial institutions in Kenya. The study sought to more specifically determine the demand side finance factors that affect private solar firms in Kenya; establish the supply side finance factors that affect private solar firms in Kenya; investigate the financing challenges facing private solar firms in Kenya; and analyze the financing opportunities available for private solar firms in Kenya. The purpose of this chapter is to present the data collected, analyzed, interpreted and synthesized. Employing a mixed-method approach, the data was collected by use of both quantitative and qualitative data collection tools. Whereas quantitative data was collected via a structured questionnaire and qualitative data via use of both desk review and key informant interview guide. Accordingly, employing a mixed-method approach, the present chapter presents results both quantitatively and qualitatively. Quantitative analysis comprises both descriptive and inferential statistics, while qualitative analysis comprises a thematic content analysis.

4.2 Response Rate

The rate of response was based on total administered questionnaires vis-a-vis the responses, 81 questionnaires were administered vis-a-vis 68 respondents. In this regard, the response rate was 84%. All 7 key informant interviews were further conducted, hence a 100% response rate. These were assumed to be sufficient to draw conclusions given the situation due COVID 19 pandemic. The return rate for the questionnaires is showcased in Table 4.1.

Table 4.1 Response Rate

	Financial Institutions	Renewable Energy Firms	Percentage (%)
Response	33	35	84.0
Non-response	8	6	16.0
Total	**41**	**41**	**100.0**

Source: Primary Data (2021)

The response rate was adequate. Creswell (2013) prescribed the following return rates; exellent (above 70%); good (60%); and adequate (50%). In addition Rea and Parker (1997) also observed the following response rates; excellent (70% and over) and adequate (50% to 60%). Similarly, Fowler (1984) postulates that a true representation rate is 60% return rate. In this regard 84% response is dimmed excellent. The researcher presented authorized documentation from the University as well as the NACOSTI research permit.

4.3 Instrument Reliability

A pretest of the questionnaire was done in a pilot study and consistency assessed through the Cronbach Alpha, set at 0.7 by Nunnally (1978). Collis and Hussey (2009) further suggest between 0.4 and 0.7 as acceptable and above 0.7 as recommended. In addtion, Tashakkori and Teddlie (2010) note that questionnaires are highly reliable if they record Cronbach Alpha co-efficient of between 0.82 and 1.00; sufficiently reliability between 0.64 and 0.81; low reliability between 0.46 and 0.64; and un-reliable between 0.10 and 0.45. The table 4.2 below indicates the reliability test.

Table 4.2: Reliability Analysis

Variable	Cronbach Alpha	No of Items	Decision
Demand Side Finance Factors	0.916	7	Highly Reliable
Supply Side Finance Factors	0.813	6	Sufficiently Reliable
Technology	0.886	5	Highly Reliable
Procurement Practices	0.812	5	Sufficiently Reliable
Access to Green Energy Financing	0.837	6	Highly Reliable

Source: Primary Data (2021)

The above results displays all study variables, the alpha co-efficient were above 0.70, the least being 0.812 and the most .916. Demand Side Finance Factors recorded the highest reliability (α = .916) followed by Access to Green Energy Financing (α = .837) then technology (α = .886) and Supply Side Finance Factors (α = .813). Procurement practices recorded the least reliability coefficient of .812. The results indicate the consistency and reliability of all the sets questions in the questionnaire. In addition, the questionnaire had sufficient reliability coefficients hence suitable for the study as prescribed by Nunnally (1978) at 0.7 alpha coefficient for internal consistency. Davis (1964) also proposed 0.5 reliability threshold.

4.4 Instrument Validity

A combination of face and content validity tests were employed in a complimentary manner. To confirm for both content and face validity, expert opinions were sought with the aim of enhancing face and content validity of the instruments used for data collection.

4.5 Descriptive Statistics

The variables were evaluated with descriptive statistics to show their manifestation with all respondents in demand and supply side finance factors, as well as financing challenges and opportunities. Under descriptive analysis, results are presented quantitatively, using means and standard deviations.

4.5.1 Demand Side Finance Factors and Access to Green Energy Financing

The demand side finance factors that affect private solar firms in Kenya were examined. The variables were analyzed using descriptive analysis then computed using the Likert scale of the 5 point type. Respondents evaluated the presented statements using a scale of 1 to 5 whereby; "No degree" was denoted by 1", "Low degree" denoted by 2, "Moderate degree" denoted by 3, "Great degree" denoted by 4 and "Very great degree" denoted by 5. A 2.4 or below mean scores were taken to indicate low affirmation, between 2.5 and 3.4 implied moderate affirmation and between 3.5 and 5.0 for high affirmation. Table 4.3 showcases the results.

Table 4.3: Descriptive Statistics for Demand Side Finance Factors

	Mean	Std. Dev
An enabling legal, policy and regulatory environment	4.103	0.933
In-house capacity to develop bankable financial and technical proposals	3.853	0.996
A ready market for renewable energy	4.059	0.912
Increasing consumer awareness on renewable energy	3.927	0.951
A growing movement towards the green economy	4.177	0.897
Composite	**4.024**	**0.938**

Source: Primary Data (2021)

Table 4.3 above shows a mean of 4.024 (SD=0.938), indicating that most participants reached high affirmation to statements pertinent to the demand side finance factors that affect private solar firms in Kenya. Most participants specifically affirmed to a great degree, to a growing movement towards the green economy (4.177); a ready market for renewable energy (4.059); an enabling

legal, policy and regulatory environment (4.103); increasing consumer awareness on renewable energy (3.927); and in-house capacity to develop bankable financial and technical proposals (3.853).

4.6.2 Supply Side Finance Factors and Access to Green Energy Financing

The supply side finance factors that affect private solar firms in Kenya were established. The Likert scale was used to compute the descriptive variables of the five-point type. Respondents evaluated the presented statements using a scale of 1 to 5 whereby; "No degree" was denoted by 1", "Low degree" denoted by 2, "Moderate degree" denoted by 3, "Great degree" denoted by 4 and "Very great degree" denoted by 5. A mean scores of 2.4 or less was also taken to indicate low affirmation, while mean between 2.5 and 3.4 imply moderate affirmation and between 3.5 and 5.0 as high affirmation. Table 4.4 showcases the results.

Table 4.4: Descriptive Statistics for Supply Side Finance Factors

	Mean	Std. Dev
Perceived risks by financial institutions in renewable energy projects	4.059	0.912
Repayment terms offered by financial institutions	3.868	0.960
High cost of credit advanced on renewable energy	4.000	0.881
Creditworthiness of renewable energy firms	4.074	0.852
Performance risk of renewable energy projects	4.191	0.797
Composite	**4.038**	**0.880**

Source: Primary Data (2021)

Table 4.3 above indicates a mean of 4.038 (SD=0.880), indicating that most respondents reached high affirmation to supply side finance factors that affect private solar firms in Kenya. A most respondents affirmed to a great degree, to performance risk of renewable energy projects (4.191); creditworthiness of renewable energy firms (4.074); perceived risks by financial institutions in renewable energy projects (4.059); high cost of credit advanced on renewable energy (4.000); and repayment terms offered by financial institutions (3.868).

4.6.3 Financing Challenges and Access to Green Energy Financing

The financing challenges facing private solar firms in Kenya were investigated. The descriptive variables were analyzed using the Likert scale of the five-point type. Respondents evaluated the presented statements using a scale of 1 to 5 whereby; "No degree" was denoted by 1", "Low degree" denoted by 2, "Moderate degree" denoted by 3, "Great degree" denoted by 4 and "Very

great degree" denoted by 5. Low affirmation was taken to indicate means scores of 2.4 or less, 2.5 to 3.4 to imply moderate affirmation and 3.5 to 5.0 imply high affirmation. Table 4.5 below showcases the findings.

Table 4.5: Descriptive Statistics for Financing Challenges

	Mean	Std. Dev
Limited access to long term financing and high interest rates	3.824	0.791
Limited understanding of financing mechanism by local financial institutions	3.882	0.764
Poor implementation of relevant policies and regulations	3.912	0.842
Limited knowledge by renewable energy firms on the availability of cheaper financing opportunities	3.882	0.744
High cases of default of loan by local financial institutions	4.397	3.592
Composite	**3.979**	**1.346**

Source: Primary Data (2021)

Table 4.5 above indicate a composite mean of 3.979 (SD=1.346), implying that most repondednts reached high affirmation to statements pertinent to the financing challenges facing private solar firms in Kenya. Most respondent affirmed to a great degree, to high cases of default both through of loan by local financial institutions (4.397); poor implementation of relevant policies and regulations (3.912); limited knowledge by renewable energy firms on the availability of cheaper financing opportunities (3.882); limited understanding of financing mechanism by local financial institutions (3.882); and limited access to long term financing and high interest rates (3.824).

4.6.4 Financing Opportunities and Access to Green Energy Financing

The financing opportunities available for private solar firms in Kenya were analyze. The descriptive analysis was computed using the Likert scale of the five-point type on the variables. Respondents evaluated the presented statements using a scale of 1 to 5 whereby; "No degree" was denoted by 1", "Low degree" denoted by 2, "Moderate degree" denoted by 3, "Great degree" denoted by 4 and "Very great degree" denoted by 5. A 2.4 or less mean scores was taken to indicate low affirmation, between 2.5 and 3.4 imply moderate affirmation and between 3.5 and 5.0 imply high affirmation. Table 4.6 indicates the results.

Table 4.6: Descriptive Statistics for Financing Opportunities

	Mean	Std. Dev
Overwhelming presence of international development finance institutions	4.088	0.640
New financing models and initiatives	4.441	0.583
The ever-increasing demand for renewable energy electricity in Kenya	4.221	0.666
Decrease in trend of cost of renewable energy technologies	3.794	0.612
Decrease in prices of renewable energy technologies over the years	3.691	0.580
Composite	**4.047**	**0.616**

Source: Primary Data (2021)

Results showcased in Table 4.6 above demonstrate a composite mean of 4.047 (SD=0.616), showing that most participants reached only moderately affirmation to statements pertinent to financing opportunities available for private solar firms in Kenya. Most respondents affirmed that to a moderate degree, new financing models and initiatives (4.441); the ever-increasing demand for renewable energy electricity in Kenya (4.221); overwhelming presence of international development finance institutions (4.088); decrease in trend of cost of renewable energy technologies (3.794); and decrease in prices of renewable energy technologies over the years (3.691).

4.6.5 Access to Green Energy Financing

Access to green energy financing for solar power projects within the private sector from local financial institutions in Kenya was investigated. The descriptive analysis on access to green energy financing was then computed using the Likert scale of the five-point type. Respondents evaluated the presented statements using a scale of 1 to 5 whereby; "No degree" was denoted by 1", "Low degree" denoted by 2, "Moderate degree" denoted by 3, "Great degree" denoted by 4 and "Very great degree" denoted by 5. A 2.4 mean scores of or less was taken to indicate low affirmation, between 2.5 and 3.4 to imply moderate affirmation and between 3.5 and 5.0 to imply high affirmation. Table 4.7 portrays the study findings.

Table 4.7: Descriptive Statistics for Access to Green Energy Financing

	Mean	Std. Dev
Over the last 5 years, the amount of credit advanced to renewable energy projects in the country has increased	3.665	0.82
Over the last 5 years, there has been an increase in applications for green energy financing in the country	4.694	0.739
Over the last 5 years, the amount of finance invested in renewable energy projects in the country has increased	3.661	0.871
Composite	**4.007**	**0.810**

Source: Primary Data (2021)

Table 4.7 above indicatea a composite mean of 4.007 (SD=0.810), suggesting most participants reached highly affirmation to statements pertinent to access to green energy financing. Most respondents specifically affirmed to a great degree, to in the respective private solar firms in Kenya, over the last 5 years, there has been an increase in applications for green energy financing in the country (4.694); over the last 5 years, the amount of credit advanced to renewable energy projects in the country has increased (3.665); and that over the last 5 years, the amount of finance invested in renewable energy projects in the country has increased (3.661).

4.7 Inferential Statistics

Under inferential statistics, in order to assess the linkage between predictor factors and the study outcome both Pearson correlation and a multiple regression analysis were used for hypothesis testing. The assumptions was of a normal distribution among variables and a linear relationship between the outcome and predictor factors for accuracy estimation.

4.7.1 Pearson Correlation

Pearson correlation was utilized to determine the direction and magnitude of the correlation of the linkage between the predictor factors and the outcome. A correlation value (r), r±1 would indicate the magnitude of correlation, the p-value of significance (Sig.) would indicate the significance of the relationship.

Table 4.8: Pearson Correlation Matrix

		Access to Green Energy Financing	Demand Side Finance Factors	Supply Side Finance Factors	Financing Challenges	Financing Opportunities
Access to Green Energy Financing	r	1				
	Sig.					
Demand Side Finance Factors	r	.666**	1			
	Sig.	.000				
Supply Side Finance Factors	r	.564**	.942**	1		
	Sig.	.000	.000			
Financing Challenges	r	.149	-.186	-.179		
	Sig.	.224	.129	.144		
	N	68	68	68	68	
Financing Opportunities	r	.548**	.379**	.388**	.271*	1
	Sig.	.000	.001	.001	.025	

**. 2-tailed correlation with significance at 0.01.
*. 2-tailed correlation with significance at 0.05.

Table 4.8 above indicate that there was a significantly strong and positive correlation between the demand side finance factors and access to green energy financing (r = .666; Sig. = .000) and the supply side finance factors and access to green energy financing (.564; Sig. = .000); as well as between financing opportunities and access to green energy financing (.548; Sig. = .000); while a weak, positive and non-significant correlation was established between financing challenges and access to green energy financing (r = .149; sig. = .224). The results imply that an improvement in demand side finance factors, supply side finance factors and financing opportunities will result in an improvement in access to green energy financing.

4.7.2 Regression Analysis

Regression analysis was performed to show the significance of each independent variable on the dependent variable, all other factors constant. The study performed a multiple linear regression analysis for hypothesis testing so as to produce regression coefficients, ANOVA and the model

summary. The hypothesis test results were interpreted based on the regression coefficients' statistical significance. Tables 4.9, 4.10 and 4.11 below present the findings.

Table 4.9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.788[a]	.621	.597	1.36154

a. Predictors: (Constant), Demand Side Finance Factors, Supply Side Finance Factors, Financing Challenges, Financing Opportunities

A correlation value (R) of .840 was established, indicating a strong, linear linkage among the variables, demand side finance factors, supply side finance factors, financing challenges and financing opportunities, and access to green energy financing. An R^2 value of .621 was further established indicating that demand side finance factors, supply side finance factors, financing challenges and financing opportunities collectively account for 62.1% of the variations in access to green energy financing, the remaining 37.9% is affected by factors not studied in the present regression model. Regression analysis also produced results for the ANOVA test.

Table 4.10: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	191.446	4	47.861	25.818	.000[b]
	Residual	116.789	63	1.854		
	Total	308.235	67			

a. Outcome Variable: Access to Green Energy Financing

b. Predictors: (Constant), Demand Side Finance Factors, Supply Side Finance Factors, Financing Challenges, Financing Opportunities

The ANOVA test results in table 4.10 above demonstrates that the the linkage between the market share and market-product strategies was significant ($F = 25.818$, p-value < 0.05). Performed at 95% confidence level, the results also show that relative to the total sum of squares (308.235), the regression sum of squares is 191.446. In conclusion, the regression model explains 62.1% of the variability in the data set while the residual sum of squares is 116.789 implying that 37.9% of the variability in the dataset is not explained.

Table 4.11: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-2.374	1.946		-1.220	.227
	Demand Side Finance Factors	.667	.130	1.192	5.128	.000
	Supply Side Finance Factors	-.388	.140	-.644	-2.762	.008
	Financing Challenges	.086	.042	.174	2.045	.045
	Financing Opportunities	.361	.110	.300	3.294	.002

a. Dependent Variable: Access to Green Energy Financing

Table 4.11 reveals that demand side finance factors (β = 1.192, sig.=.000<.05), supply side finance factors (β = -.644, sig.=.008<.05), financing challenges (β = .174, sig.=.045<.05) and financing opportunities (β =.300, Sig.=.002<.05) significantly influence access to green energy financing at 95% confidence level.

4.7.3 Hypothesis Testing

Inferential statistics were further employed to test the study hypotheses which were stated in the null. To this end, the coefficients associated with each variable were tested for statistical significance at 95% confidence level. As such, the condition for statistical significance and therefore decision to reject or accept the null hypotheses was determined at 0.05 confidence interval. Coefficients associated with variables with P-values less than the level of significance (P<.05) led to rejection of the null hypotheses stated while coefficients associated with variables with P-values greater than the level of significance (P>.05) led to acceptance of the null hypotheses stated.

H_{01}: Demand Side Finance Factors is not significantly associated with access to green energy financing among private solar firms in Kenya

Demand Side Finance Factors was significantly associated with access to green energy financing among private solar firms in Kenya (β = 1.192, sig.=.000<.05). The foregoing findings provide enough evidence to reject the null hypotheses that Demand Side Finance Factors was significantly

associated with access to green energy financing among private solar firms in Kenya (H_{01}). The study therefore concludes that there exists a statistically significant relationship between Demand Side Finance Factors and commercial banks' competitiveness in Nairobi County.

H_{02}: Supply Side Finance Factors is not significantly associated with access to green energy financing among private solar firms in Kenya

Supply Side Finance Factors was significantly associated with access to green energy financing among private solar firms in Kenya (β = -.644, sig.=.008<.05). The foregoing findings provide enough evidence to reject the null hypotheses that Supply Side Finance Factors was significantly associated with access to green energy financing among private solar firms in Kenya (H_{02}). The study therefore concludes that there exists a statistically significant relationship between Supply Side Finance Factors and commercial banks' competitiveness in Nairobi County.

H_{03}: Financing Challenges is not significantly associated with access to green energy financing among private solar firms in Kenya

Financing Challenges was significantly associated with access to green energy financing among private solar firms in Kenya (β = .174, sig.=.045<.05). The foregoing findings provide enough evidence to reject the null hypotheses that financing challenges was significantly associated with access to green energy financing among private solar firms in Kenya (H_{03}). The study thus deduces that access to green energy financing among private solar firms in Kenya is significantly influenced by financing challenges.

H_{04}: Financing Opportunities is not significantly associated with access to green energy financing among private solar firms in Kenya

Financing Opportunities was significantly associated with access to green energy financing among private solar firms in Kenya (β =.300, Sig.=.002<.05). The foregoing findings provide enough evidence to reject the null hypotheses that financing opportunities were not significantly associated with access to green energy financing among private solar firms in Kenya (H_{04}). The study thus deduces that access to green energy financing among private solar firms in Kenya is significantly influenced by financing opportunities.

4.8 Thematic Content Analysis

In thematic content analysis, data was transcribed, coded then presented narratively using identified themes. According to Braun and Clarke (2006), thematic content analysis begins the moment the researcher starts noticing patterns within the data collected. Table 4.12 showcases the steps that this study adhered to during thematic content analysis.

Table 4.12: Steps in Thematic Content Analysis

Step	Procedure
1. Transcribing	Upon conducting interviews, all interviews were transcribed verbatim
2. Familiarizing	All transcribed information is read for purposes of creating familiarity. Data was also cleaned by erasing unnecessary words and repetitions
3. Generation of initial codes	The entire information is read and re-read with a view to comprehend it better, looking out for patterns and meanings. Initial coding is then started.
4. Search for pertinent themes	The codes were grouped into possible themes, and refined to ensure a coherent pattern
5. Definition and theme naming	The themes and sub themes were then defined, giving them working titles
6. Production of the report	Once the themes and sub themes are defined, analysis and report writing begun

Source: Obuya and Ong'ondo (2020)

4.8.1 Demand Side Finance Factors Affecting Private Solar Firms in Kenya

Under the demand side finance factors affecting private solar firms in Kenya, two main themes were identified. These include current policy and regulatory environment and the in-house financial capacity to develop bankable proposals. Under current policy and regulatory environment, the following sub-themes were identified: Effectiveness in creating an enabling business environment for the private sector investment renewable energy in Kenya; the financial institutions perspective on the existing regulations and policies; duration required from licensing application to approval; regulatory requirement's necessary for establishing a renewable energy firm; and knowledge of green credit lines from development financial institutions. Under in-house financial capacity to develop bankable proposals, the following sub-themes were identified: availability of capacity to develop bankable proposals; whether financial institutions offer technical assistance where technical capacity is lacking; and effects of lack of technical capacity on credit supply.

4.8.1.1 Current Policy and regulatory environment

The study collected information from both the renewable energy firms and financial institutions on the existing policies, regulations and laws and their effectiveness in creating an enabling business environment for the private sector investment renewable energy in Kenya as well as their influence on improving access to financing of renewables. Primary data collected included: the duration required from licensing application to approval of a private renewable energy firm as well as the regulatory requirement's necessary for establishing a renewable energy firms and knowledge of existing green credit lines being offered to financial institutions in Kenya. Secondary data involved review of the existing policies related to investment of renewable energy in Kenya and how they affect access to financing.

Kenya over the years has provided attractive policy incentives for development of the sector which has enabled Kenya to be put on the map on climate change interventions and specifically Renewable Energy. These include the Feed-in Tariff (FiT) policy, net metering, VAT Act 2014 which offered exemption from Value Added Tax and import duties among others opened doors for investment in Kenya. In addition, through being signatories to the UNFCCC and the Kyoto protocol Kenya has been successful in attracting external climate change finance facilities for adaptation and mitigation e.g. the Green Environmental Facility (GEF), Climate Investment Funds (GIF) Green Climate Fund (GCF) and the Reducing Emissions from Deforestation & Forest Degradation in Developing Countries (REDD). In the private sector programmes like the Scaling up Renewable Energy Programme (SREP) have also come to light.

The study aimed to determine whether the existing policies, interventions and laws attract investment of Renewable Energy Firms in Kenya by enable easier business operation in Kenya. Government policies and regulations are key to driving up the level of investment in Renewable Energy. According to Abolhosseini and Heshmati (2014) Feed-in-tariffs, tax incentives, and tradable green certificates are the key mechanisms used by governments to support RE financing.

The study revealed that policies such as the Feed-in-Tariff (FiT) Policy 2012 was skewed towards large scale renewables connected to the grid with PPAs at the expense of small investments producing below 10MW. In addition, the transactional cost in negotiating and signing a PPA contract are standard irrespective of the production levels hence leaving small producers at a

disadvantage due to the standardization of PPAs. According to Engola, (2019), this prevents an environment of competition, creates delays and puts off investors.

> *"There is already a feed-in-tariff, but the implementation of the feed-in-tariff is not good. If you speak to any developer trying to develop a project, they will tell you it is not what is in the law, but the practice of the law. This is normally the biggest challenge. The laws can be good but the implementation is a problem."*

The findings coincide with a study by Engola, (2019) who conducted a study on 'D*rivers and challenges of feed-in tariff policy in Kenya'*. Engola (2019) recommended inclusion of projects below 10MW as well as adding net metering and mini-grids sources such as solar as alternative options.

The key informants also noted that the feed-in – tariff (FiT) has spurred very little growth of renewable energy as experience has shown a case in point is the Kenya Tea Development Agency (KTDA), how in an attempt towards energy efficiency decided to venture into RE and selling surplus electricity to KPLC through the FIT mechanisms. However, KPLC being a monopoly buys the power at the lowest price from the private sector (average of USD 0.12 per Kwh for solar) and sells at (average of USD 0.17 per kWh leaving them at a disadvantage. According to Rahnema, *et al* (2017) Kenya is one of the priciest electricity in SSA, for instance in comparison to Ethiopia who sell at USD 0.047 per kWh.

The implementation of the FiT in policy has also been a challenge with Meyer-Renschhausen, (2013) indicating that it is categorized as a maximum tariff as opposed to a guaranteed tariff which is subjected to open negotiations between the distribution company such as KPLC and the Renewable Energy Firms. In such a scenario, many of the renewable energy projects face bottlenecks in financing because the future revenues cannot be planned for. These findings correspond with findings on by the O. E. C. D. Secretariat, (2013) which notes that key to an enabling investment environment in clean energy is the promotion of investment policy principles such as non-discrimination, investor protection and transparency (Secretariat, 2013).

However, despite study findings, in 2021 the Ministry of Energy and Petroleum revised the 2012 FiT Policy in an effort to address the challenges faced by introducing th*e* Feed in Tariffs Policy on in January 2021. Some of the changes are that the policy will only apply to RE power plants not exceeding 20MW in biomass, biogas and small hydro technologies. All other projects larger than

20MW will be procured under the Renewable Energy Auction Policy 2021. In addition, the government shall offer no security or guarantee for projects approved for implementation hence investors will need to consider alternative approaches to mitigating political risk events.

Based on the Energy Policy 2019 the study identified the issue of red tape brought about by the Energy regulator EPRA. They noted the multiple bureaucratic approvals put in place disfavor small renewable energy projects as opposed to large projects. Other related to bureaucracy included the delay in getting approvals to the numerous licenses required to operate a new project which they cited as translating to increased operations costs.

The Energy Petroleum Regulatory Agency formerly Energy Regulatory Commission is mandated to regulate both the Energy & Petroleum industry in Kenya. In the energy sector alone, the regulator has several responsibilities including; regulation, assessment, monitoring, licensing, coordination, certification, inspection, audit investigation and formulation of energy regulations among other duties. These appear as many responsibilities for one agency can lead to delay in decision making due to the bottle necks involved. The study findings collaborated with research done by Engola (2019). The key informants cited bureaucracies associated with decision making by government agencies in issuing licensing and approvals which were described as time consuming and inefficient. These findings also correspond to findings by the International Financial Law Review (IFLR), 2017 that states that legislative and regulative complexity due to lack rational frameworks and bureaucracy impact the flow of actual investment from the private sector. In addition, Boyle *et al* (2014) while reviewing the policy and regulatory barriers in Kenya noted that poor enforcement of existing legislation and lack of compliance presented a barrier to the private sector investment in climate change related initiatives.

The key informants also noted that the level of taxation was also proving to be a big challenge in the operation of the Renewable Energy Firms in Kenya. All the key informants noted that the introduction 14% VAT tax in the Finance Act 2020 on Solar equipment in addition to local permits, freight charges, custom clearance and import led to the increase in cost of doing business and subsequently the cost of solar equipment effective 1st July 2020. One of the key informants dealing with stand-alone-solar products revealed that although the burden of tax was transferable to customers in the long term, profits from solar products are also slim:

"Business is a little bit harder because the first two or three weeks after introduction of VAT at the standard rate of 14% effective 1St July, we had to reimburse some customers since we had already provided quotations before 30th June not including VAT. It was hard to convince a customer who paid after 30th June that they need to add some funds to accommodate 14% VAT."

The views of the key informants on the impacts of VAT tax on solar products were echoed in a policy paper addressed to the government by (GOGLA (global association for the off-grid solar energy) & Kenya Renewable Energy Association and the Africa Clean Energy Technical Assistance Facility (ACE TAF, 2021). KEREA and GOGLA estimated that by March 2021 the impact of the VAT tax had driven the sales of standalone solar products down by 25%, while consumer subscriptions had gone down by 20%, the fall in demand being associated with the retail prices increase of between 10-24%, the price of solar products alone increased from 16-40 % especially in remote areas. This left private investors in Kenya at a disadvantage in comparison to counterparts such as Uganda and Tanzania that still enjoy tax exemption for both VAT and import duty.

The financial institutions key informants noted that policy and regulatory environment has an asymmetric effect on the renewable energy sector, this could be mainly attributed to both the supply and demand side factors. They opined that they were not directly affected by Renewable Energy related polices since the financial institutions focus on the returns and credit risk and not on the cost of doing business, in this regard government policies and regulations mostly affect renewable energy firms and the end customer who has to bear all costs. However, this can be disputed by studies conducted in Africa by the ACT ETA (2020) which states that clear and enforceable polices are required to deliver the project economics that attract private commercial debt and equity capital.

One key informants further noted that the current structure in the energy market is such that Kenya Power and Lighting Company (KPLC) has monopoly with GoK owning 50.1% of the shares hence controlling the pricing of electricity under the PPAs hence make it difficult for small and private firms to profit from the industry due to factors such as the standardization of Power Purchase Agreement processes as well as the fact that pricing is not fixed over the PPA agreed contract duration which creates a repayment risk for the financier. The key informants had this to say:

"The PPA arrangement was where we were all stuck, the off taker was not guaranteeing that they would off take the power produced at a certain price across the years".

The study aimed at determining the average duration taken from application to issuance of license and the Power purchase agreement by the EPRA as well as the Environmental Impact Assessment by NEMA. According to the EPRA the process of application for a business license as a user is done online on the https://portal.epra.go.ke:8443/site/login portal by registering as a user and obtaining access credentials. In addition, depending on the license category applied for, they are required to attach soft copies of the documents. EPRAs service charter (Attached Appendix VIII) notes that it takes a maximum of 60 days from the date of successful submission for license for generation, transmission, distribution and supply of electrical energy. In addition, the study sought to determine the duration taken to receive a NEMA EIA license. According to NEMA the process of application is also automated and done online through the https://accounts.ecitizen.go.ke/ portal. The Environmental Impact Assessment/Audit (EIA/EA) Regulations, 2003, the EIA license is issued within a period of 45-90 days. In addition, the NEMA fee is equivalent to 0.1% of the project cost with a minimum of KSh.10, 000 with no upper limit. In addition, according to ERC 2012, FiT policy licensing application and implementation guidelines, the process from application to approval of the Power Purchase Agreement (PPA) takes an estimated 10 months as per the following timelines: review of Expression of Interest (3 months), review of feasibility study (3 months), Conclusion of non-negotiable PPA (4 months), approval of PPA by EPRA.

The key informants from the Renewable Energy Firms corroborated that the process of license application and renewal was quite efficient due to the automation of the application process. In addition, the key informants noted that long as they had licensed technicians approved by the EPRA, the process was quite flawless. One key informants from the financial institutions, noted that due to the scale of their clientele, the process of application especially at the project development phase can be lengthy for instance, they noted that the process of review and approval of the PPA can take up to as long as 6 years to get a PPA that last for between 10-25 years, whereas according to the EPRA citizen's service delivery charter, the process is expected to take 90 days. These findings corroborate with a study by Rahnema *et al* 2017 that noted extensive PPA approval periods citing an example of Strathmore University's solar PV project that commenced 0.6 MW production of solar electricity in June 2014 and did not get approval till October 2015.

The study sought to investigate some of the regulatory requirement necessary for operating a renewable energy firm in terms of generation, distribution and supply and how these requirements are likely to affect access to financing in Kenya. The key informants confirmed that licenses and permits are issued by the EPRA and that the regulatory requirements depend on the level of electricity generation that is licenses are issued for production above 3MW and permit for those below 3MW. For instant the key informants from Sollatek Electronics (Kenya) a distributor and installer of Solar PV equipment noted that the process of acquiring a permit and renewal for distribution and supply is well structured and is done in an online platform in the EPRA website estimated at Ksh 1000 P/Gwh as well as licenses of technicians based on their classification. On the other hand, Quest works Limited renewable energy C&I engineering, procurement and construction (EPC) companies produces more than 2MW of solar projects hence goes through a process of scrutiny of the uploaded documents hence takes more days. The firm pays license for generation, distribution and supply for license Ksh 20,000 P/MW and 10, 000 P/MW renewal as indicated below in tables 4.2 and 4.3

Table 4.13: Classification & License fee

	Classification	Application (Ksh)	Annual Renewal (KSh)
1	Application of license	10,000)	
2	Generation	10,000 P/Mw	5,000/= per MW
3	Transmission	2,000 P/Mw	1,000 Per/Mw
4	Distribution	1,000 P/Gw	1,000 Per/GW
5	Generation, Distribution and/or supply	20,000 P/Mw	10,000/= per MW
6	Electricity Supply	1,000 P/Gw	500/= per GW annually

Table 4.14: Classification for license License of Solar PV technicians, Contractors, Vendors and Manufacturers

	Class	Application fee (Ksh)	License fee (Ksh)	Renewal fee (Ksh)
Contractors, Vendors and Manufacturers	Class C1	500	1,000	1,000
	Class V1	1,000	2,500	1,000
	Class V2	2,000	5,000	2,500
Solar PV technicians	Class T1	250	1000	500
	Class T1	500	2000	750
	Class T3	750	3000	1000

Source: EPRA Citizens Service Delivery Charter

The classes represent as follows: C1 license, design and installation work for solar PV systems; V1 license, design, distribute, promote, sell or install solar PV systems; V2 license, manufacture

or import solar PV systems components; TI Design, install, commission, maintain, & repair solar PV systems > 400 watts; T2 design, install, commission, maintain, and repair of solar PV systems > 2 kW; andT3 design, install, commission, maintain, and repair grid-tied solar PV systems > 50 kW;

From the above it can be noted that renewable energy firms operating under a large capacity have more requirements. The outcome coincides with a study conducted by the Kenya Renewable Association (KEREA) 'Inventory of Regulatory Requirements to Start and Operate A Renewable Energy Project in Kenya in 2012, that noted the fact that the clearances vary in nature and scope depending on the renewable energy source being invested for instance investment such as geothermal and wind have more clearances as opposed to setting up solar installation and distribution firms. The study identified 22 regulatory clearances required for investors in Renewable Energy Firms by the EPRA. These include: six (6) of these 22 sector specific clearances; three (3) environment related clearances; seven (7) general clearances necessary to operate a company in Kenya and; six (6) in order to own/lease the land and construct the power plant in Kenya

According to the EPRA, the following documents are necessary during application for a solar PV license based on the Solar Photovoltaic Systems Regulations, 2012: application Letter to EPRA; certificate of incorporation; memorandum and/or Articles of Association; business permit; list and Particulars of Directors and shareholders, (CR-12) and copy of Identity cards; certificate of registration; proof of land ownership or lease agreement; valid tax compliance certificate; class G work permit for foreign workers and copy of Passport; solar technician certificate - T3 for all categories and consent letter form technician; solar technician certificate - T2 for category V1&V2 and consent letter from technician; and copy of completion certificate for the projects already done. The next step is followed by an inspection of the premises, notification to pay grant fee/ license and collection of licenses. Other forms of renewable energy firms the following additional documents are required based on the scale of production including: environmental Audit Report; Environmental Impact Assessment license; copy of newspaper advertisement; copy of notice to local/county government; draft or signed PPA and Information according to the Feed in Tariff Policy; copies of most recent audited report; financial projections; and sources of finance and capital proposed to be expected.

The study sought to determine the level of awareness of renewable energy firms on the existence of credit lines offered by development financial institutions to local financial institutions aimed at subsidizing the cost of green financing. According to the study, only one out of the three renewable energy firm key informants, that is Quest works limited were aware of the existence of green credit lines provided by selected financial institutions They however noted that the development financial institutions only finance projects above a certain thresh hold that above USD40 Million making it a challenge for small Renewable Energy projects. This is mainly due to the fact that most private RE projects especially in developing countries are too small for mainstream investors. This study correspond with Shishlov *et al.* (2017) who notes that limited knowledge and capacity impairs the development of the market for debt financing of green investments, in addition, the World Economic Forum (2013) also notes the existence of low level awareness by financial institutions to partner on existing green growth opportunities.

4.8.1.2 In-house capacity to develop bankable financial and technical proposals

The study sought to determine the availability of the in-house financial and technical capacity (technical capacity) to develop bankable proposals by the renewable energy firms. This included investigating the availability of capacity to develop technical financial proposals, challenges faced in the event of lack of and weather financial institutions offer technical assistance where technical capacity is lacking.

The study sought to determine how lack of or insufficient technical capacity to develop financial proposals hindering access to financing. Two key informants from the renewable energy firms stated that they had adequate in-house capacity to develop bankable proposals for both project feasibility and financial risk assessment. The key informants without technical capacity however noted that the process required many documentations including the availability of licensed engineers on various scales (T1-T3) by EPRA who are required to provide the required technical information e.g., the feasibility studies, Bill of Quantities among others which translate to the amount of credit required as well as projected cash flow estimates. Due to the lack of technical capacity, they incur more costs in consultancy fee to prepare sufficient proposals.

According to Shishlov *et al* (2017) availability of technical assistance can be a great panacea for supply-side barriers to green lending. Technical assistance can be provided in the areas of identification of investment opportunities, feasibility studies, project appraisal and proposal writing, drafting business plans, capacity building of financial institution employees on loan application, monitoring and evaluation, marketing and communication to stimulate demand of credit with clients (ACT TAF, 2020). When the researcher probed further on whether the renewable energy firms without in-house technical capacity are able to tap the technical assistance from financial institutions, mixed reactions were elicited.

Only one of the renewable energy firm key informants noted that the local financial institutions do not offer technical assistance. they however noted that they prefer to seek the assistance for proposals writing and cash flows projections from professional's consultants and there after approach financial institutions which improves their confidence levels of success while applying for credit financing. In addition, they contrasted the local financial institutions with the development financial institutions. International financier has a thorough understanding of the renewable energy industry including the risks involved as opposed to the local financial institutions who insist on guarantees due to their limited understanding of the industry. In this regard Development financial institutions offer cheaper credit with more lenient terms

Two of the key informants from the financial institutions noted that they provide technical assistance were lacking to renewable energy firms in areas such as review of financial proposals and required documentation. In contrast, the financial institution who do not provide technical assistance noted that the renewable energy firms received technical assistance from entities such as the KAM (Kenya Association of Manufacturers) who provide platforms for their members. The financial institutions hence refer these clients to KAM and other institutions such as the SUNREF (Sustainable Use of Natural Resources and Energy Finance) on proposal development, and Kenya Renewable Association (KEREA) in association with the Kenya Private Sector Alliance (KEPSA).

The study probed the key informants from financial institutions on weather lack of technical capacity of renewable energy firms to develop bankable proposals affected supply of credit. They all agreed that technical capacity directly affected access to credit. These findings co-relate to findings by the Organization for Economic Co-operation and Development (OECD) (2020) and Shishlov *et al* (2017) and Bhamidipati, *et al* (2021), who noted that inadequate in-house capacity

to develop sound proof investment proposal affect access to financing particularly for small firms dealing with RE. Bhamidipati et at (2021) notes that MSMEs in particular lack business skills in proposal writing, have limited understanding of accounts and finance hence don't articulate complex financial calculations which present a severe barrier in accessing financing from commercial banks

The following were cited by the key informants from financial institutions: technical capacity is vital as it is used to inform the project success as well as quantify the risk of return. While they indicated that the success rate differed from a number of factors such as credit history and the amount borrowed, one noted that the key factors that affect success of credit application in addition to technical capacity is the ability to provide collateral. They noted that technical capacity within renewable energy firms inform risk of return since it informs or reduces the performance, operations and repayment risks involved. This particular financial institution received a credit line from the AFD (French Development Agency) in 2015 November to 2019 worth 10 million Euros to finance renewable energy and energy efficient projects targeting only private firms (not available for public utilities). Beneficiary renewable energy firms after vetting would receive technical assistance from the SUNFEF as well as financial assistance and risk assessments from the financial institutions.

One key informants added that they have a set criterion of evaluating risk. Most of the time submitted proposals by renewable energy firms do not meet the expected criteria. They stated that:

> *"Financial institutions have a straightway of assessing creditworthiness, and evaluating the risk criteria. When those models are applied to renewable energy packages, they do not catchup. The proposals that we come across do not state exactly what financial institutions would be looking for as bankable solutions. Secondly there is disconnect between borrowers who are the credit entities and the suppliers of these solutions mostly the EPCs. The EPC players tend to have more technical knowledge."*

Based on this, the study revealed that the level of technical knowledge depended on the level or scale of investment that is EPCs seem to have more technical knowledge than the smaller renewable energy firms. In addition, they rely on credit from international financial institutions noted that, in addition to providing credit international financial institutions also provide technical assistance including skilled engineers and technical assistance of the feasibility study and even at times supply of their own technologies.

4.8.2 Key supply side finance factors that affect private solar firms in Kenya

Under the supply side finance factors affecting private solar firms in Kenya, two main themes were identified. These include perceived risks by financial institutions in renewable energy projects and the current requirements necessary during credit application. Under perceived risks by financial institutions in renewable energy projects, the following sub-themes were identified: type of finance offered by financial institutions; the repayment terms offered by financial institutions; the renewable energy firms; and the cost of finance. Under the current requirements necessary during credit application, the following sub-themes were identified: required documents during credit application; effects of lack of adequate documentation; and duration for credit approval by financial institutions.

The study sought to identify the major supply side finance factors affecting private renewable energy firms. The supply side factors under considerations included: perceived risk of return. The interviews sought to understand some of the risks faced while offering credit to renewable energy firms. Some of the questions included the type of finance offered by financial institutions, the repayment terms offered by financial institutions, the cost of finance for renewable energy projects and the perceived risks; requirements necessary to access financing. The study sought to understand some of the required documents during credit application and their uniqueness to the industry. The interviewer also sought to understand some of the effects of lack of these documentation on access to credit as well as the duration taken to access credit when all documentation is provided

4.8.2.1 Perceived risks by financial institutions in renewable energy projects

According to Fatoki (2012), the risk of return in the renewable energy sector is critical due to the highly volatile nature of the industry were the cost of capital stands at 90% of project cost for construction at the inception phase alone. For developing countries, the risks are perceived to be even higher due to reliance on technological advancement from the developed countries (Nyamongo and Nyamongo, 2019).

Key among the risks faced in this industry are fast turn out in technologies as well as inconsistency in pricing of these technologies, environmental and political risks, market risk, business/strategy risks, and operation risk. These risks have forced financial institutions to devise ways of managing

the risks whether perceived or real. The study sought to determine how the perceived risk associated with providing credit from financial institutions affected access to credit.

The study sought to determine based on the theory of financial inclusion weather the renewable energy firms sought financing, and if so which type of financing, in addition the study went further to investigate which type of financing are offered by the financial institutions and its suitability or acceptability to the renewable energy firms. This would help assess whether the demand for debt financing really does exist and weather the FIs were meeting this demand.

According to Ashaye and Alharahsheh, (2019), the three major ways of financing private renewable energy firms are through borrowing (debt financing from international and national financial institutions), equity financing (venture capital), grants (gift) and guarantees (insuring existing risks). Other means of financing include; Insurance and pension funds, the stock market, real state and even mutual funds which are popular on long term equity financing. In addition, most private renewable energy firms seek financing within early-stage that is feasibility studies to assess electricity generation potential and secure investment financing, at the startup up period for infrastructure development support, Project financing and during scale-up to establish a credible path to financial sustainability and at replication for viable and tested business models.

The interviews with renewable energy firms revealed that they had different project financing strategies. According to one of the key informants, they sought partnerships that funded 100% of the project capital. Another indicated that they sought both equity and debt financing from commercial banks as well as short term financing by purchasing equipment on credit however their main source of financing is their parent company based in London UK. The last key informants Quest works LTD indicated that their firm sourced credit from international financial institutions s as well as through reinvestment of cash flows, while avoiding local financial institutions. This can mostly be attributed to the fact that the firm is and EPC and C&I operating on large scale hence able to attract funding from international financial institutions who in addition offer better terms at cheaper rates.

These findings coincide with a study done by Kariuki and Rai (2010) which states that most commercial banks in Kenya do not provide specific energy financing products. This in turn locks out small private businesses and leaves the big companies who are able to attract financing from international financial institutions.

The key informant's interviews by the financial institutions also sought to determine the most common type of financing options offered to renewable energy firms during credit application and the risk mitigation mechanisms behind it. They had different views on the financing options offered to the renewable energy firms one indicated that the financing options consists of both debt and equity financing at the ratio of 30% equity and 70% debt so as to share risks. In this scenario, most renewable energy firms were forced to seek further partnerships in order to raise the 30% equity. One commented as follows:

> *"When a customer approaches us, there is no way a bank will finance 100% debt, there has to be an element of customer contribution which is usually above 30% their equity. So, it means that this customer is either provide the equity or partner with an investor to give that 30%."*

Contrasting views came from two key informants who indicated that their financial institutions offer purely debt financing due to the business nature of financial institutions that is profit from lending, in addition they also facilitated importation of equipment's by providing letters of guarantee for payment. At micro-scale lending, the SMEP Micro Finance Institution noted that they provide credit directly to their clients investing in stand-alone household solar products or for energy efficiency for small businesses. In addition, they lack diversified financing options for renewable energy products.

According to research done by Mahama, Derkyi and Nwabue (2020), in Ghana one of the challenges facing the implementation of renewable energy projects is availability of long-term capital. This is based on the background that renewable projects have a capital structure that can be described as front-loaded, where the capital costs account for an estimated 90%, characterised by low operation cost (Dhruba, 2018).

In the Kenyan context, the study sought to determine flexibility of the repayment terms icluding the range of moratorium duration generally given by financial institutions on either principal or interest or both depending on the scale of RE project as a risk mitigation measure. For a broader understanding both the renewable energy firms and the financial institutions were interviewed

One the key informants from the renewable energy firms noted that the repayment plan is complicated by a number of parameters or factors that include inter alia: financial institutions lending policies, credit amount, cash flow estimates, and the scale of project. However, from a general point of view, small scale project lacks flexible repayment plan, however, renewable

energy firms can leverage on a negotiated repayment plan that commences repayment after the commissioning of the project rather than immediately after disbursement. This point was concurred by another who was also of the view that despite the differing lending policies by financial institutions, renewable energy firms have a window to negotiate a repayment plan. They further added that the debt to be utilized locally within Kenya is borrowed in local currency, however, most renewable energy firms prefer to borrow in foreign currency such as the USD so as to facilitate importation of equipment's as well as allow for ease of selling the power produced to KPLC which pays in USD. This strategy is meant to mitigate against the risk of variations in cost credit over time caused by factors such as inflation and fluctuations in currency exchange. In addition, the reliance on local currency in the importation and installation of equipment required by renewable energy firms presents a risk due to inflation of local currency against the foreign currency as Mahama *et al*, (2020), found out in a study in Ghana.

The study further identified a sharp contrast between lending by the local financial institutions and the development finance institutions, this dichotomy was brought to light by one the renewable energy firms (Quest works limited) operating at a large scale who stated that they seek funding mainly from development finance institutions. The interview indicated that the development finance institutions agree to friendlier repayment terms depends on the type of amortization for inventory financing (repayment on specific duration) and moratorium for asset financing (repayment after asset has generated revenue). In this situation they receive self-amortization. Self –amortization is whereby renewable energy firms make payments consisting of both principal and interest while ensuring that the credit will be paid off by the end of an agreed-upon term. The tenure period however is negotiable.

The study concluded that the repayment terms depend on various factors such as the type of Renewable Energy source (solar projects have less repayment duration usually that is less than 2 years as opposed to geothermal project that go up to 10 years), the repayment policies by financial institutions, the amount borrowed, length of project, availability of alternative cash inflows, credit history (credit score) of the applicant amongst others.

One key informants noted that it allows its client's repayment up to 10 years' including a moratorium/grace period (servicing the interest and not paying principle) thereafter repayments must be made according to plan. Another indicated their reluctance to stretch the repayment

period beyond 8 years, and that the moratorium was tied to the debt on capital investments only. This finding can be related to Ashaye and Alharahsheh, (2019), who noted that few guarantees from governments or multilateral institutions, insufficient legal protection and framework for protection of investor rights, lack of payment discipline and enforcement are the key challenges to private sector investments.

One the factor that hamper the growth rate of renewable energy technologies and their deployment is the cost of finance (Mahama *et al*, 2020). This study sought the views of key informants from financial institutions. One indicated that the financial institutions did not have differentiated interest rates for renewable energy firms' products that is, there were not special interest rate for credit advanced on Renewable Energy projects. Based on the Section 36 (4) of the Central Bank of Kenya Act, the Central Bank Rate (CBR) stands at 7% (July 2021), in addition according to the CBK the Commercial Banks Weighted Average lending rate is 12.05 %. At the period of data collection, the weighted average lending rate was 11.9%, however key informants interviewed charged between 13-14 %.

In addition, the study revealed that renewable energy firms who have a USD deposit scheme, receive a discounted lending rate in USD, one noted that if the customers require credit in Kenya shillings, they give them 13%. Those aware of these special schemes borrow in dollars to reduce the cost of credit. One key informants who received a green credit line form AFD noted that they offered lower interest rates to renewable energy firms below the market value that is under 50%-75% discount with flexible repayment plans due to the fact that they equally received the credit with very minimal interest rates. Studies show that the reduction in the cost of finance can equally reduce the cost renewable energy project by as much as 30% in developing countries (Dhruba, 2018).

Another key informants indicated that they offered loans at 13% however those seeking credit in foreign currency had a favorable repayment rate that ranged from 6-9%. The commercial financial institutions had a great contrast in comparison to Microfinance Institution that they offer credit at 5% interest with no special rates for Renewable Energy financing.

According to Gitman and (2020) commercial banks impute high risks to small enterprises due to their high-risk profiles associated with factors such as uncertain competitive environment; inadequate accounting systems; non-registration of assets, delay in payments of products and

services, and strains in human and financial resources. This is opposed to standard risk assessment mechanism and credit history. These risks are considered even higher for renewable energy firms. One of the key informants highlighted operational risk citing that since most renewable project takes long during the construction stage of up to 2 years, there are possibilities of project disruption during this delicate interval before official operation. Another was apprehensive of the operation risk that can result in interruption of project operation which can translate to default in credit.

Another key informants raised the issue of creditworthiness of renewable energy firms arising from project disruptions such as environmental and political risk that is climate change and community conflicts for example a hydroelectricity project failure due to drying of rivers and change in the policy and regulatory environment. The financial institutions cited considering the novelty of some the Renewable Energy technologies that is fast turn out, insufficient technical expertise or resources to hire specialized staff to run operations of the establishment, client's diversion of cash flows to other commitments instead of repayment/servicing of the loan.

One of the key informants from the renewable energy firms opined that financing is no longer perceived as a challenge citing availability of many development finance institutions. He noted that

> *"Financing is widely available." "There is a lot of money out there looking for opportunity. What's more difficult to get now is a viable project, good clients, good people, well-structured projects good teams, good deliveries. I think those are bigger problems than project financing."*

Further, according to him, lack of financing within the Renewable Energy sector is symptom of internal failure within the renewable energy firms that lead to mismatch between renewable energy firms and investor interests. He noted that local financial institutions "do not understand well enough renewable energy", signaling out solar energy as the most misunderstood Renewable Energy which leads to difficulty in accessing finance.

4.8.2.2 The current requirements necessary during credit application

The study sought to understand the documents required during credit application from private REFs, explore some of the effects of lack of adequate documentation and on successful application. The study revealed that there is no standardized documentation while seeking financing from financial institutions. This is mainly due to the fact that different financial institutions have different credit lending policies. In addition, the study revealed that there is a

dichotomy in requirements by both local financial institutions and development finance institutions. One key informants noted that development finance institutions request for confidential documentations from renewable energy firms. The study identified a list of requirements from local FIs and harmonized them in Table 4.4 below.

Table 4.15: List of renewable energy financing requirement by local Financial Institutions

No	Requirements within the organization	Specifics
1	Regulatory requirements; these are documents mostly needed for regulation form NEMA, EPRA, KPLC	License/permit for operation, PPA, ESIA, EIA, Feasibility studies
2	Audited financial statements going back 3 years	
3	Audited financial reports	Profit/Loss statements, Assets and liabilities,
4	Projected cash flows	
5	Bank statements for a period of 6 months	
6	Business proposal	Business profile, organogram,
7	Guarantee/Security (property/assets) or bank guarantee	Land, equipment, shares
8	Legal Statutory business documentation	Kenya Revenue Authority business PIN, Certificate of incorporation, Tax compliance Certificate.
9	Credit Application form	

The study further revealed that required documentation to access financing also depended on the scale or financing or amount required a key informants from the renewable energy firms dealing with the stand-alone solar products for domestic lighting, mobile phone charging, and low power electrical devices noted that the requirements for accessing finance were easier requiring only personal identification documents, business permits, and alternative collateral, credit history and bank or mobile money statements. These views explain the rapid expansion of stand-alone solar among the rural poor, as shown in a study by (Oruoch, 2015). Oruoch studied the financial aspects of stand-alone solar systems in Kenya and find out that the flexibility in accessing finance and convenience of repayment led to fast growth in the sector.

The key informants further revealed that one of the key documents that influenced access to credit was availability of collateral. This finding collaborated with Gangata & Matavire, 2013 who noted that key among documents requested during credit application was provision of collateral as security when there is difficulty in determining the credit rating or credit history. In addition, collateral requirements determine the length to which borrowers commit assets as security for

repayment. According to Mulei & Bokea (2000), most banks that provide credit require 100% collateral.

According to Beck, *et al* (2006) access to finance is impacted greatly by both financial inclusion and exclusion. The inability to provide all the required business documentation leads to financial exclusion and de-risking. According to the study, it was quite evident that due to the nature of the RE sector and its volatility in factors such as volatile technology and exchange rates, financial institutions compensate for risk involved with request for extensive documentation especially in risk full sectors such as Renewable Energy. In the event of failure to provide key documentation, renewable energy firms are denied access to credit. This greatly affects the level of investment in the sector by the private sector.

The study sought to investigate the duration taken from credit application to disbursement from both renewable energy firms and financial institutions, from the response it was noted that it varies from one institution to another based on various factors such as the credit policies, amount borrowed and the type of renewable energy being financed. The key informants from financial institutions itemize a number of reasons that include but not limited to the ability of the renewable energy firms to provide the required documentations necessary for credit processing, the reputation of the requesting firm (established firms have better ratings than startups), and also the amount of credit requested. With regards to actual time frame taken for the credit conditions to be met, one key informants indicated that their response to credit application was within two (2) weeks, the other one indicated a period of between 3 to 6 weeks. One key informants a Micro Finance Institution gave a contrasting view of between 3 to 5 days, this was the shortest period among all key informants. The response rate is likely due to the size of the financial institutions

4.8.3 Challenges faced in financing private solar firms in Kenya

Under challenges faced in financing private solar firms in Kenya, the following themes were identified: limited access to long-term credit and high local interest rates; financial institutions limited understanding of renewable energy business models and the financing mechanisms; poor implementation and inconsistency in the legal and regulatory environment; limited knowledge by renewable energy firms on availability of financing opportunities; high cases of default; lack of specialization and understanding of renewable energy financing; poor quality of financial proposals.

Renewable energy projects are capital intensive due to the high upfront costs involved at the start (Dhruba, 2018. Access to finance therefore becomes a critical factor in the deployment of Renewable Energy technologies especially in developing countries. Based on this, the study sought to investigate some of the key challenges involved in investment in the private solar industry in Kenya. So as to get a thorough understanding of challenges involved, the researcher conducted literature review on some of the factors that create challenges in financing RE in the private sector. Ashaye and Alharahsheh, (2019) notes the following as what causes limitations in financing RE in Africa; Market related issues which includes the financing models i.e. is it mostly government led, grants or market led, maturity of the market and availability of market information among others ; Political and policy related issues such as non-prioritization of Renewable Energy sector, limited regulations and operational frameworks and existing operational risks and uncertainty of the political environment ; Technology concerns i.e. up-front cost of technology, limited research and development and high operational risks due to obsoleteness of technology and; Nature of the renewable energy projects i.e. focus on government-led power projects, and scale of projects. Key informants representing the renewable energy firms noted the following key challenges:

4.8.3.1 Limited access to long-term credit and high local interest rates

The study revealed lack of access to long-term credit by the renewable energy firms. One of the key informants from financial institution noted their reluctance to stretch the repayment period beyond 8 years. As a result, most renewable energy firms seek high cost and short-term credit from unreliable sources to finance their ventures. Based on studies done by Ashaye and Alharahsheh, (2019), government guarantees from FiT schemes provide a minimum of 10 years as additional security for private investors as seem in the Morocco PV rural electrification programme. These incentives if extended through guarantee to the local financial institutions can create an avenue for cheaper finance in Kenya. According to Wohlgemuth and Painuly (2002) the government is encouraged to privatize or rather adopt market-led pricing as well as sovereign guarantees so as to create an environment for long term debts for the pricing sector.

The study further revealed the charging of higher interest rates for Renewable Energy products in comparison to development financial institutions. The study revealed that key informants from financial institutions charged between 13-14 % however according to Bhamidipati *et al* (2021) commercial banks in Kenya charge anywhere between 10-15% or even higher while international

financiers charge between 7-10% including conversion of currency. In particular financial institutions in Kenya provide financing which is considered expensive in comparison to other countries. According to the East Africa Banking Survey 2019, Kenya has much higher lending rates than Uganda, Tanzania and Rwanda. In addition, the financing offered is not suitable for renewable energy investment that is the type of financing provided is short term with limited availability of long-term finance.

4.8.3.2 Financial institutions limited understanding of Renewable Energy business models and the financing mechanisms

The key informants from financial institutions noted that limited understanding of the renewable energy sector finance mechanisms presented a key challenge in accessing financing. The study revealed strict lending conditions as a risk mitigation strategy which can be attributed to the limited knowledge of the sector. These findings corroborate with Bhamidipati *et al* (2021) who notes that most local financial institutions use international standards as benchmarks for lending in Kenya, of which most of the time is not always well adapted to suit the Kenyan context. Bhamidipati *et al* (2021) further notes in particular to the solar PV market in Kenya that a gap exists between local financial institutions and solar PV private firms, they note that local financial institutions lack knowledge and understanding of the sector including the business models, and the company structure among others, also solar PV businesses lack skills in writing bankable proposals hence deliver low quality proposal.

Brown and Magallon (2012) while reviewing financial mechanisms for Renewable Energy note that debt finance is usually provided by financial institutions including project finance, corporate lending, refinancing and mezzanine finance, and refinancing. In addition, equity financing is provided mostly by equity or other sources such as pension funds injected directly into REF. Hence is unlikely that financial institutions should request for a combination of both debt and equity financing as revealed by the study. It is upon the renewable energy firms to review its financial needs and then request for a certain percentage of debt financing and further seek equity or venture capital financing from another source.

In addition, the financial institutions are very insistent on collateral in the form of land, houses, cars equivalent to the value as the credit applied in addition to a lot of due diligence which is time-

consuming with many processes. These findings are corroborated by studies by the Energy for impact Annual Review (2016), Shishlov, *et al* (2017) and (Financial Sector Deepening, 2015).

4.8.3.3 Poor implementation and inconsistency in the legal and regulatory Environment

According to Brown and Magallo (2012), uncertainty in the policy environment creates an ambiguous investment climate which is not attractive to private investors. The key informants noted lengthy bureaucratic process of getting initial licenses and permits from EPRA that directly translate to delays the process of credit approval. This can be corroborated by findings that cited documentation such as permits and licenses as prerequisites for disbursement by financial institutions. This mostly affects the large projects (above 3MW) whose regulatory requirements are expansive as opposed to smaller projects. These findings are corroborated by Justice (2009) on its impact on investment in RE. Financial services policies such as credit information sharing also affect access to RE investments (ACT TAF, 2020). In addition, the fiscal measures put in place tend to erode the gains made in growth of RE investments.

In 2016, the East Africa Community introduced restriction to the duty exemption on solar goods. This was implemented by GoK hence raising the prices of solar products. The inconsistencies by the GoK since 2016 including VAT exemptions and reinstated several times also affects the cost of doing business, the most recent being the passing of the Finance Act 2020 which introduction of VAT on solar based equipment. The inconsistencies can also be witnessed by the capping of the lending interest rates as a monitoring policy in 2016. Based on a study by the CBK on the impact of the capping of the interest rates in 2016, the number of loan accounts declined significantly between October 2016 and June 2017 with small private firms being most affected (CBK, 2018).

The study further revealed a challenge in the variation of expertise in skilled technicians who are licensed and regulated by EPRA. This challenge however has since been addressed by EPRA through the enactment of the Energy Act (2019) established regulations that ensure standardization of expertise in the Kenyan Market by ensuring that foreign companies in Kenya hire and train local licensed individual technicians with the aim of increasing local capacity (Bhamidipati, *et al* (2021)

The study further revealed that while the GoK through the Energy Act 2012 section 162 put in place attractive incentives for investors, the implementation has proven to be a challenge, for

instance while provisions has been made for Net Metering which allows generation of electricity and using the excess to offset power utilities through KPLC, net metering was only officially put into legislation after the enactment of the Energy Act 2019, in addition, while the provisions require that only those consumers producing above 1MW to sign a power purchase agreement with KPLC, the provisions were skeletal and required additional complementary subsidiary framework legislation developed by both EPRA and Ministry of Energy and Petroleum towards the roll-out of a net-metering program to the public. The Energy Act 2019 provides for a relatively high limit for consumers that is above 1MW generation systems to be used in a net metering system. This provides a disincentive for small scale private sector producers.

4.8.3.4 Limited knowledge by Renewable Energy Firms on availability of financing opportunities

The study revealed limited knowledge of green credit lines offered by development finance institutions in collaboration with local financial institutions. This displayed the gap in awareness on the availability of cheaper financing options available through credit lines such as the French Development Agency (AFD), Propaco and Internationals Finance Corporation (IFC) etc. These opportunities are likely to drive up the uptake of local credit in the industry through FIs and at cheaper costs. These findings corroborate with Ashaye and Alharahsheh (2019) who proposed development and implementation of information sharing policy strategies to involve key stakeholders including local financial institutions and renewable energy firms in existing available opportunities. This challenge also is of a secondary nature in that the end users being supplied with renewable energy technologies that is households and commercial enterprises also lack awareness on available renewable energy financing option and how to access hence limiting the demand of renewable energy investments in Kenya. Respondent representing the financial institutions noted the following challenges:

4.8.3.5 High cases of default

The study through primary and secondary data revealed high cases of default in financing Renewable Energy in Kenya, both from the stand point of local financial institutions and from government-led multilateral financing. Despite the dynamic financial services sector which incorporates models such as mobile money, green bonds and guarantees by financial institutions among other. The cases of default have presented a source of concern from local financial

institutions. Rolffs, Byrne, and Ockwell (2014) assessed the potential of emerging payment solutions such as the Pay-as-you-go model by both commercial banks and development financial institutions as well as its advantages over traditional solar finance approaches in Kenya. The findings revealed that the Pay-as You-go model failed to achieve scale due to high cases of defaults. Case in point were projects such as the (1) ESMAP (Energy Sector Management Assistance Project) implemented by the WB in collaboration with financial institutions which was cancelled due to incidences of significant loan default, (2) GEF/WB Photovoltaic Market Transformational Initiatives (PVMTI) whereby USD 30 million was availed for channeling through commercial financial institutions to end users to stimulate the solar photovoltaic market in East Africa also cancelled due to various challenges including inefficiencies in processing credit. The above findings collaborated with primary findings of tight requirements for financing by the financial institutions such as insistence on collateral and credit history which is usually unreliable. One key informant further noted the risk of default due to operational risks such as interruption of Renewable Energy project due to factors such as community conflicts and politics interference and environmental related issues. In addition, diversion of inflows towards other commitments instead of repayment/servicing of the loan.

4.8.3.6 Lack of specialization and understanding of Renewable Energy financing

The study further revealed that most of the financial institutions do not offer specialized products on green lending. In addition, factors such as cost of credit, repayment terms were equally standardized irrespective of the uniqueness in the industry, this in turn prevents the sector from reaching its full market potential. This is likely as a result of factors such as dominant government-led financing in Kenya, lack of guarantee by the government and multilateral institutions during lending as well as the instability in the regulatory environment.

The key informants from financial institutions have also failed to keep up with the first changing technologies that are within this industry which also affects the cost of financing. Technology changes fast and hence they need to keep up with current events that inform and affect financing. They noted the following

> *"That technology has been changing so fast, so quickly and the prices are coming down so fast, so what you would have financed for 1 million US dollars today, in case of default if that customer does not pay you then you cannot sell those panels as your security. You will be left with an asset that you cannot resell."*

4.8.3.7 Poor quality of financial proposals

The quality of credit applications was noted as a key challenge in accessing financing, poor quality of application leads to delays in the credit application process as well as denial of credit in the long run. The availability of technical capacity within the renewable energy firms determines the quality of applications forwarded to financial institutions as well as success during credit application. (Shishlov *et al* 2017).

4.8.4 Opportunities available for improving access to financing of RE in Kenya

Under opportunities available for improving access to financing of RE in Kenya, the following themes were identified: overwhelming presence of international development finance institutions; new financing models and initiatives; the ever-increasing demand for renewable energy electricity in Kenya; and decrease in trend of cost of renewable energy technologies. The growing concerns over the rising levels of carbon in the atmosphere has led to efforts to deploy cleaner and sustainable energy technologies. According to Donastrog and Suresh (2017), RE sector has experience tremendous growth in recent past as Nations commit to emissions targets under climate change mitigation regimes. This growth comes along with a wide range of investments sources that enable the availability of funds to meet capital costs.

In the Kenyan context, the study sought to determine the opportunities available to renewable energy firms and financial institutions. Key informants from renewable energy firms and financial institutions gave varying views on what they perceived as opportunities.

4.8.4.1 Overwhelming Presence of International Development Finance Institutions

Key informants representing financial institutions gave different perspectives on what existing opportunities were and how to unlock the latent opportunities in the RE sector. One key informants from financial institutions indicated that development finance institutions are capable of lending to local financial institutions at cheaper rates. This way, the local financial institutions are in a position to transfer these benefits to REFs leading to the expansion of RE sector. Another respondent also noted that, the introduction of developmental partners such as WB, USAID, AFD, DFID, GEEREF, EEP, AREF, KOPSAP and Proparco among others has created an opportunity for cheaper financing of this industry while targeting the private sector while providing technical

assistance and risk mitigation instruments, financial structuring. Even while providing lower rates than the Kenyan market still make more returns in Kenya as compared to their markets back home.

4.8.4.2 New financing models and initiatives

In addition to financing models reveled from the literature review such as the Results Based Financing, the key informants noted that initiatives such as "*jiko poa*" a pay as you go energy solution and the *M-kopa* mobile money refinancing models present a good opportunity for growth of clean cooking sources and equally attractive private investment in Kenya. However, on further research the study revealed that although these initiatives were attractive at first site, the success factor has proven to be challenging. Based on the finding by Rolffs, Byrne, & Ockwell (2014) and (Gataru, 2019) it can be assumed that for the success of these models, factors such as stable, transparent and accountable financial sector, effective policies, strong partnership frameworks and extensive government support

4.8.4.3 The ever-increasing demand for Renewable Energy electricity in Kenya

One key informants noted that the rapid growth in real estate industry in Kenya has a huge potential for uptake Renewable Energy particularly solar electricity which can be exemplified by the government's commitment to increase uptake of renewables to 85% by 2030. In addition, the rural population in Kenya who don't have access to electricity have been increasingly seeking solar electricity hence a huge opportunity for Renewable Energy in Kenya at lowered costs. In addition, the default risk for Renewable Energy products such as solar solutions by households is low due to the intrinsic value customers have on them.

4.8.4.4 Decrease in trend of cost of Renewable Energy Technologies

Within the last 10 years, the financing renewable energy market in Kenya has experienced tremendous growth in Kenya portraying the existence of a more mature state that as before which can be demonstrated by the increasing interest by financial institution's willingness to support the financial process related to supplying renewable energy technology and services.

4.9 Discussion

The findings imply that access to green finance among a majority of private solar firms in Kenya is to a great degree a function of demand side finance factors, key among which include a growing movement towards the green economy; a ready market for renewable energy; an enabling legal, policy and regulatory environment; increasing consumer awareness on renewable energy; and in-house capacity to develop bankable financial and technical proposals. This is consistent with Yu and Xu (2019) who found that policies by the government have a strong influence on green financing. The findings also agree with Tran *et al.* (2020) that another set of factors identified in the study include awareness in green investment; awareness on green finance access; the role of mobilization tools for green capital as well as government's role. Similarly, according to Shishlov *et al*, (2017) some of the demand and supply side barriers to green lending by local financial institutions include: limited understanding of opportunities for climate investment, existing business practices and in adequate in-house capacity to develop sound proof investment proposal.

The findings are of the implication that supply side finance factors are to a great extent, among the factors to which access to green finance among a majority of private solar firms in Kenya can be attributed to. In this regard, among the most notable supply side finance factors include perceived risks by financial institutions in renewable energy projects; high cost of credit advanced on renewable energy; performance risk of renewable energy projects; creditworthiness of renewable energy firms; and repayment terms offered by financial institutions. The findings are in tandem with Falcone and Sica (2019) who found that among the criticalities in access to green finance include lack of financial suppliers' involvement in biomass production, the temporary orientation of financial tools and limited technical expertise within firms and financing options. Cui (2017) also showed that green credit increased at a faster rate compared to other loan types and that assigning higher credit to the overall loan portfolio decreases a financial institution's bank ratio of non-performing loans. The results suggest that with increasing demand, green financing is a less risky venture. Similarly, Eyraud, Clements and Wane (2019) found that economic growth boosts investment in green projects and that some such policy interventions as "feed-in-tariffs" and carbon pricing scheme introduction significantly and positively influence green investment.

It can be inferred from the results that financing challenges are to a great extent, also among the factors to which access to green finance among a majority of private solar firms in Kenya can be attributed to. Among the most notable supply side finance factors include This is agreement with Thi et al. (2020) who cite complications in seeking credit for activities in green investment; inducements in accessing funds for investment in green investments; and the amount of funds which green investment businesses can access. Similarly, Baumli and Jamasb (2020) established in their empirical research factors such as access to finance among others directly determine the levels of domestic spending on infrastructure projects.

The study deduces from the findings, that access to green finance among a majority of private solar firms in Kenya is to a great degree a function of financing opportunities, key among which include decrease in prices of renewable energy technologies over the years; the ever-increasing demand for renewable energy electricity in Kenya; decrease in trend of cost of renewable energy technologies; overwhelming presence of international development finance institutions; and new financing models and initiatives. This is line with Forcella, Castellani and Huybrechs (2017) who analyzed green opportunities in microfinance lending in the Caribbean and Latin America. The study observes that including environmental standards in credit products among microfinance institutions with a view to encourage access to more efficient or clean energy use, sustainable activities or decreasing environmental and climatic risk for microenterprises or low-income households is a growing and dynamic market in the Caribbean and Latin America, with forthcoming and existing opportunities. The findings are also in tandem with Gulyamova (2020) that in the Russian economy, notable levels of investment can be adopted by an adequate method that not only implies investment in production of high-tech processes and solutions, but also an adequate mechanism of financing which can channel both financing technologies and external and internal financial resources to "green" projects.

The findings imply that over the last 5 years, there has been an increase in applications for green energy financing in the country to a great degree; while the amount of credit advanced to renewable energy projects in the country has increased and the amount of finance invested in renewable energy projects in the country has increased only to a moderate degree. As such, while private solar energy has increasingly applied for green financing in the last 5 years, actually financing remains low. This is consistent with Forcella et al. (2017) who found thar institutional buy-in, clear

strategies and client outreach in green financing are still low, and that appropriate tools and better coordination, strategies and products ought to be developed to realize the possibility of a thriving green microfinance industry in the Caribbean and Latin America.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

The purpose of this chapter is to give a summary of the study findings as well as conclusions drawn from the findings, and give recommendations arising from the study findings. The summary of the findings is discussed as per the objectives.

5.2 Summary of key findings

The summary is categorized per study objective as follows;

5.2.1 The Demand Side Finance Factors Affecting Private Solar Firms

The demand side finance factors that affect private solar firms in Kenya were examined. Most participants specifically affirmed to a great degree, to a growing movement towards the green economy (4.177); a ready market for renewable energy (4.059); an enabling legal, policy and regulatory environment (4.103); increasing consumer awareness on renewable energy (3.927); and in-house capacity to develop bankable financial and technical proposals (3.853). It was further revealed from content analysis that an environment where policy support is inconsistent or unstable impedes investment hence only through the creation of a stable policy, legal and regulatory environment can Kenya have a level playing field for growth of renewable energy technologies for all its players. The study also revealed that most renewable energy firms have the resident expertise to develop bankable financial and technical proposals absence of which they seek outsource or seek technical assistance. The study further revealed that technical assistance in developing bankable proposals was readily available through affiliations such as KEREA and KEPSA including through existing partnerships such as the SUNREF.

5.2.2 The Supply Side Factors Affecting Financing of Solar Energy Firms

The supply side finance factors that affect private solar firms in Kenya were established. Most participants specifically affirmed to a great degree, to performance risk of renewable energy projects (4.191); creditworthiness of renewable energy firms (4.074); perceived risks by financial institutions in renewable energy projects (4.059); high cost of credit advanced on renewable energy (4.000); and repayment terms offered by financial institutions (3.868). It was also established that the solar PV market in Kenya has faced challenges over the years such as fast turn out in

technology, importation of faulty equipment and limited technicians within the solar PV market. This perception has over the years resulted in de-risking and financial exclusion. The study also revealed the absence of standardized documentation during credit application by financial institutions mainly due to variations in the type of credit being applied for, the scale of financing and the lending policies among other.

5.2.3 Challenges Faced in Accessing Renewable Energy financing in Kenya

The financing challenges facing private solar firms in Kenya were investigated. Most participants specifically affirmed to a great degree, to high cases of default both through of loan by local financial institutions (4.397); poor implementation of relevant policies and regulations (3.912); limited knowledge by renewable energy firms on the availability of cheaper financing opportunities (3.882); limited understanding of financing mechanism by local financial institutions (3.882); and limited access to long term financing and high interest rates (3.824). The study further revealed that the cost of financing is much more expensive and short term by local financial institutions as opposed to development financial institutions likely as result of poor risk assessment mechanisms. It was also shown that the limited understanding of financing mechanism by local financial institutions can be demonstrated by strict lending terms and insistence on collateral and limited financing products targeting renewable energy lending; and that poor implementation of policies and regulations can be demonstrated by lengthy and standardized bureaucratic process and the presence of monopolies that limit competition. The study further revealed inconsistency and retrogression of policies.

5.2.4 Opportunities Available in Accessing Renewable Energy Financing in Kenya

The financing opportunities available for private solar firms in Kenya were analyze. Most participants specifically affirmed that to a moderate degree, new financing models and initiatives (4.441); the ever-increasing demand for renewable energy electricity in Kenya (4.221); overwhelming presence of international development finance institutions (4.088); decrease in trend of cost of renewable energy technologies (3.794); and decrease in prices of renewable energy technologies over the years (3.691).

The descriptive analysis on access to green energy financing was also computed. Results show that most participants specifically affirmed to a great degree, to in the respective private solar firms

in Kenya, over the last 5 years, there has been an increase in applications for green energy financing in the country (4.694); over the last 5 years, the amount of credit advanced to renewable energy projects in the country has increased (3.665); and that over the last 5 years, the amount of finance invested in renewable energy projects in the country has increased (3.661).

Findings from a multiple regression analysis provided enough evidence to reject the null hypotheses that demand side finance factors (β = 1.192, sig.=.000<.05) was significantly associated with access to green energy financing among private solar firms in Kenya (H_{01}). Findings also provided enough evidence to reject the null hypotheses that supply side finance factors (β = -.644, sig.=.008<.05) was significantly associated with access to green energy financing among private solar firms in Kenya (H_{02}). The findings further provided enough evidence to reject the null hypotheses that financing challenges (β = .174, sig.=.045<.05) was significantly associated with access to green energy financing among private solar firms in Kenya (H_{03}). The findings also provided enough evidence to accept the null hypotheses that financing opportunities (β =.300, Sig.=.002<.05) was significantly associated with access to green energy financing among private solar firms in Kenya (H_{04}).

5.3 Conclusion of Findings

The study concludes that there exists a statistically significant relationship between demand side finance factors and commercial banks' competitiveness. The findings imply that access to green finance among a majority of private solar firms in Kenya is to a great degree a function of demand side finance factors. The study concluded that the policy and regulatory environment surrounding the renewable energy sector in Kenya is biased towards large scale renewable energy projects funded by the government and its development partners at the expense of the private players who produce at a small and medium sized scale. In this regard, the picture presented is on an underdeveloped or immature private sector which could be as a result of the dominance of government led financing which resulted in pricing monopoly by the KPLC. This has led to overall suppressed growth of the private sector due to lack of competition. The stable investment environment should provide confidence to investors which in turn creates demand for financing in the sector.

The study also concludes that there exists a statistically significant relationship between Supply Side Finance Factors and commercial banks' competitiveness. The findings are of the implication

that supply side finance factors are to a great extent, among the factors to which access to green finance among a majority of private solar firms in Kenya can be attributed to. The supply side factors such as the cost of finance, repayment terms, availability of required documentation and perceived risk by financial institutions also affect the appetite for financing. When these conditions are conducive for private players the demand for investment of renewables will equally increase.

The study further concludes that access to green energy financing among private solar firms in Kenya is significantly influenced by financing challenges. It can be inferred from the results that financing challenges are to a great extent, also among the factors to which access to green finance among a majority of private solar firms in Kenya can be attributed to. The private sector equally faces many challenges while seeking credit resulting in limited growth and competition, this can be attributed to the lack of specialization and failure of adoption tested renewable energy financing mechanisms such as the result-based financing mechanism and the Pay-as-you-go payment model.

The study finally concludes that access to green energy financing among private solar firms in Kenya is not significantly influenced by financing opportunities. The study deduces from the findings, that access to green finance among a majority of private solar firms in Kenya is to a great degree a function of financing opportunities. As such, several factors create an opportunity for a turnaround including decreasing cost of renewables especially solar electricity, overwhelming presence of development finance institutions offering cheaper debt facilities with better repayment terms.

5.4 Policy recommendations arising from the study findings

The study has revealed the key role played by the government in shaping the growth of any industry. In particular, this industry requires much more intervention due to the intensive investment required. Some of the interventions include; regular impact review of policy and regulatory environment, local investment in research and development in renewable energy technologies through technical training institutes; public awareness on available financing opportunities as well as technical assistance to financial institutions on viable financial mechanisms for renewables such as results based financing; encouraging growth as well as developing the financial infrastructure for long term financial instruments targeting renewable energy such as green bonds.

In addition, in consideration of the key finding on the challenges in accessing financing both from a demand and supply perspective, the study recommends establishment of an institution that can offer technical assistance to renewable energy firms including financial advisory services as well as guarantees that cover the high risks involved. This can be a replication of the Uganda Energy Credit Capitalization Company (UECCC) which provides guarantees, refinancing, cash reserving, liquidity refinance, bridge financing, interest rate buys down to the energy sector.

5.5 Suggestions for further research

Based on literature review and study findings, the researcher suggests further academic research on the overall sources of financing of renewable energy project in Kenya by the private sector including equity financing as a buildup of this study. There is need for policy makes and investors to understand the current sources of financing by private sector renewable energy firms and enhance the environment under which they operate all with the goal of stability in the sector.

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APPENDICES

Appendix I: Questionnaire

Please respond by ticking as suitable in the provided boxes.

Instructions

- There is no wrong answer; each response will be treated as a correct one. Your opinion is what is required in this study.
- Do not think too long about each statement. It should take you around 10 minutes to complete

Part A: Demand Side Finance Factors

Please show the degree at which you affirm to the following, as the demand side finance factors affecting private solar firms in Kenya, based on your professional experience. Use the scale: 1 to denote "No degree", 2 to denote "Low degree", 3 to denote "Moderate degree", 4 to denote "Great degree", 5 to denote "Very great degree"

Demand Side Finance Factors	1	2	3	4	5
An enabling legal, policy and regulatory environment					
In-house capacity to develop bankable financial and technical proposals					
A ready market for renewable energy					
Increasing consumer awareness on renewable energy					
A growing movement towards the green economy					

Part C: Supply Side Finance Factors

Please show the degree at which you affirm to the following, as the supply side finance factors that affect private solar firms in Kenya. Use the scale: 1 to denote "No degree", 2 to denote "Low degree", 3 to denote "Moderate degree", 4 to denote "Great degree", 5 to denote "Very great degree"

Supply Side Finance Factors	**1**	**2**	**3**	**4**	**5**
Perceived risks by financial institutions in renewable energy projects					
Repayment terms offered by financial institutions					

High cost of credit advanced on renewable energy					
Creditworthiness of renewable energy firms					
Performance risk of renewable energy projects					

Part D: Financing Challenges

Please show the degree at which you affirm to the following, as the financing challenges facing private solar firms in Kenya. Use the scale: 1 to denote "No degree", 2 to denote "Low degree", 3 to denote "Moderate degree", 4 to denote "Great degree", 5 to denote "Very great degree".

Financing Challenges	**1**	**2**	**3**	**4**	**5**
Limited access to long term financing and high interest rates					
Limited understanding of financing mechanism by local financial institutions					
Poor implementation of relevant policies and regulations					
Limited knowledge by renewable energy firms on the availability of cheaper financing opportunities					
High cases of default both through of loan by local financial institutions					

Part E: Financing Opportunities

Please show the degree at which you affirm to the following, as the financing opportunities available for private solar firms in Kenya. Use the scale: 1 to denote "No degree", 2 to denote "Low degree", 3 to denote "Moderate degree", 4 to denote "Great degree", 5 to denote "Very great degree".

Financing Opportunities	**1**	**2**	**3**	**4**	**5**
Overwhelming presence of international development finance institutions					
New financing models and initiatives					
The ever-increasing demand for renewable energy electricity in Kenya					
Decrease in trend of cost of renewable energy technologies					
Decrease in prices of renewable energy technologies over the years					

Part F: Access to Green Energy Financing

Please show the degree at which you affirm to the following as true, regarding access to green energy financing for solar power projects within the private sector from local financial institutions in Kenya. Use the scale: 1 to denote "No degree", 2 to denote "Low degree", 3 to denote "Moderate degree", 4 to denote "Great degree", 5 to denote "Very great degree".

Access to Green Energy Financing	**1**	**2**	**3**	**4**	**5**
Over the last 5 years, the amount of credit advanced to renewable energy projects in the country has increased					
Over the las 5 years, there has been an increase in applications for green energy financing in the country					
Over the last 5 years, the amount of finance invested in renewable energy projects in the country has increased					

Appendix II: Interview Guide

The interview guide was intended to conceptualize the key objectives studied and how they affect access to financing so as to understand both demand side and supply side factors that affect access to and issue of financing and the existing challenges as well as opportunities if any and how they affect your level of investment in renewable energy. Data was collected separately form the renewable energy firms and from the financial institutions.

The interview guide is divided into two (2) parts; part one is a brief introduction of the key informants and their involvement in the organization and part two (2) is divided into four (4) as per the study objectives.

PART ONE (Both Renewable Energy Firms and Financial Institutions)

- Key informants name and gender
- Position in the organization.
- The types of renewable energy technology financed by your institution
- Length of duration involved in financing of renewable energy products in the organization.
- Overall experience in renewable energy financing.

PRIVATE SECTOR RENEWABLE ENERGY FIRMS

Objective 1: Determine key demand side finance factors affecting Private Renewable energy firms in Kenya

1) Do the existing policies, interventions support your company's efforts towards increasing access to financing for renewable energy?

2) What is the average duration taken from application to approval of licensing?

3) What are the regulatory requirement's necessary to operate a private renewable energy firm in Kenya?

4) Do you have adequate in-house technical financial capacity to develop bankable proposals?

5) Do you receive outside technical assistance for preparing documentation?

Objective 2: Establish key supply side finance factors affecting Private Renewable energy firms in Kenya

6) How do you finance your renewable energy projects, debt or credit?

7) What is the most common type of financing repayment options offered to you by financial institutions?

8) What are the required documents necessary to access credit from a financial institution?

9) Are you aware of existing credit lines offered by development finance institutions in Kenya?

Objective 3: Determine the key financial challenges/roadblocks facing private solar firms in Kenya.

10) What are the key challenges/ roadblocks/constraints faced by your institution in accessing financing by local financial institutions in Kenya?

Objective 4: determine the key financing opportunities available for private solar firms in Kenya?

11) What are the existing opportunities or incentives available to improve access to finance by the private from private renewable energy firms in Kenya?

FINANCIAL INSTITUTIONS

Objective 1: Determine key demand side finance factors affecting Private Renewable Energy firms in Kenya

1) Do the present policy and regulatory interventions by the government improve access to finance for your institution?

2) Does the technical financial capacity of private renewable energy firms to develop bankable proposals affect supply of credit in your in your institution? Please explain.

3) Does your institution provide/offer in house technical financial capacity/guidance/support in during credit application? Please explain

Objective 2: Determine key supply side finance factors affecting Private Renewable Energy firms in Kenya

4) What is the most common type of financing offered to private firms in your institution?

5) What financing repayment models does your institution offer to private sector?

6) What is the current cost of finance unique to renewable energy products in your institution?

7) What are some of the perceived risks involved in providing/offering credit to private renewable energy firms in your institution? And how do this perceived risks affect supply of financing?

8) What are some of the required business documentation necessary to access financing by private sector renewable energy firms and do the affect supply of credit in your institution? Please explain

9) What is the average duration taken from application to disbursement in accessing renewable energy by private sector firms in your institution?

Objective 3: Determine the key financial challenges/roadblocks facing private solar firms in Kenya.

10) What are the common challenges/ roadblocks/constraints faced in supply of financing to RE private firms in your institution?

Objective 4: determine the key financing opportunities available for private solar firms in Kenya?

11) What are the existing opportunities or incentives available to improve access to finance by the private from private renewable energy firms in Kenya?

Appendix III: Research Clearance Permit No: NACOSTI/P/20/5904

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NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 614179

Date of Issue: 29/July/2020

RESEARCH LICENSE

This is to Certify that Miss. keziah SHEILA chanyisa of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: ACCESS TO GREEN ENERGY FINANCING; CASE STUDY OF PRIVATE RENEWABLE ENERGY FINANCING IN KENYA for the period ending : 29/July/2021.

License No: NACOSTI/P/20/5904

614179

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix IV: Budget and Work Plan

No	Description	Amount
1	Transportation	15,000
2	printing	10,000
3	Equipment: Recorder	5,000
4	Research Permit	1,000
5	contingency	10,000
	Total Budget	**51,0000**

No	Activity	May 2020	Jun-July 2020	Aug 2020	Sept-Dec 2020	Jan-Jun-21	Aug-21	Sept-21	Oct-21	Nov-21	Dec-21
1	Preparation of pre-proposal										
2	Finalization of Proposal										
3	Presentation of Proposal										
4	Data collection										
5	Data Analysis and presentation										
6	Presentation of Research project										
7	Correcting the research project										
8	Printing and submission										

Appendix V: Letter from Department Authorizing Data Collection

UNIVERSITY OF NAIROBI
Department of Geography and Environmental Studies

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P.O. Box 30197-00100
NAIROBI
KENYA

16th July 2020

The Director
National Commission for Science, Technology & Innovation
NACOSTI Building, Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI, KENYA.

RESEARCH PERMIT: KEZIAH SHEILA CHANYISA– C50/8591/2017

This is to confirm that the above named is a Masters student at the Department of Geography and Environmental Studies, University of Nairobi. He is pursuing Master of Arts in Environmental Planning and Management.

He is currently undertaking a research project titled: **"Access to Green Energy Financing: A case study of Private Renewable Energy financing in Kenya"**

Any assistance accorded to him will be highly appreciated.

CHAIRMAN
Department Of Geography
and Environmental Studies
UNIVERSITY OF NAIROBI

Dr. Boniface Wambua
Chair, Dept. of Geography and Environmental Studies

Appendix VI: List of Private Sector Renewable Energy Firms Registered by KEREA

NO	LIST OF PRIVATE RENEWABLE ENERGY COMPANIES REGISTERD BY KENYA RENEWABLE ENERGY ASSOCIATION 2020
	Combined Technologies
1	Sowetic Kenya (solar and wind)
2	Enel Green Power Kenya Ltd (RE Gen)
3	Frontier Investment Management (RE Gen)
4	Kenergy (RE Gen)
5	Helios Group Ltd (RE Gen)
6	Schneider Electric (EE Gen)
7	Powergen Ltd (RE Gen)
8	EED Advisory (RE Gen)
9	Africa Enterprise Challenge Fund (RE Gen)
10	Micro Enterprises Support program Trust (RE Gen)
11	Norken International Limited (RE Gen)
12	Kurrent Technologies Ltd (RE Gen)
13	Dream EP Global Energy Ltd (RE Gen)
14	Lean Energy Solutions Ltd (RE Gen)
15	Dream EP Global Energy Ltd (RE Gen)
16	SCODE Ltd (RE Gen)
17	Technical Engineering Service Ltd (RE Gen)
18	Blue Quadrant Limited (RE Gen)
19	KENGEN
	Solar Energy
1	Mkopa Solar
2	Toyota
3	Centum- Two River Mall
4	Garden City Mall
5	Quest works Strathmore University
6	Some of the Serena Group of Hotels
7	Doshi Group Ltd
8	Unilever Kenya Limited
9	All Park Industries Ltd, Mlolongo
10	UNEP Headquarter
11	Solarworks E.A Ltd
12	Sunlar Solar Ltd
13	Solattek
14	GreenLink Solar Ltd
15	Solar Panda Ltd
16	Jinko Solar.
17	Mobisol
18	Suntransfer

19	Illumina Africa Limited
20	SNC-LAVALIN
21	Viruga Power Ltd
22	Daima Energy Ltd
23	Chloride Exide Ltd
24	Renewable World
25	GreenLight Planet
26	PAWAME Kenya Ltd
27	SUNDANZER
28	Total Kenya PLC
29	SUNBELL Kenya Ltd
30	AGSOL
31	Sunfunder
32	SUNami Power Limited
33	Bboxx
34	East Africa Energy Analytics
35	Modest International Logistics Ltd
36	Davis & Shirtliff
37	Center For Alternative Technologies
38	SteelStone(k)Ltd
39	Solibrium
40	Knights and Apps Ltd
41	One Acre Fund
	Bio Energy
1	Biogas Power Holdings E.A Ltd
2	kenya Biogas Stakeholders Network
3	Biolite Holdings Kenya Ltd (And solar)
	Geothermal Energy
1	Akiira Geothermal Ltd
2	Geothermal Development Corporation
	Hydro Energy
1	Norken International

Appendix VII: List of CBK Licensed Financial Institutions In Kenya

No	CENTRAL BANK OF KENYA DIRECTORY OF LICENCED COMMERCIAL BANKS				
	Bank	**Contacts**	**Date of licence**	**Branches**	**Tier**
	COMMERCIAL BANKS				
1	ABSA Bank Kenya Plc	Absa Headquarters, Waiyaki Way, Westlands, Nairobi.	1916	85	Large
2	Access Bank (Kenya) PLC	Transnational Plaza, City Hall Way, Nairobi.	8th January, 1985	28	Small
3	African Banking Corporation Ltd	ABC Bank House, Woodvale Groove, Westlands, Nairobi. Peer Group	8th December, 1994	13	Small
4	Bank of Africa Kenya Ltd	BOA House, Karuna Close, Off Waiyaki Way, Nairobi Date	30th April 2004	30	Medium
5	Bank of Baroda (K) Ltd.	Baroda House, 29 Koinange Street, Nairobi.	1st July, 1953	14	Medium
6	Bank of India	Bank of India Building, Kenyatta Avenue.	5th June, 1953	5	Medium
7	Charterhouse Bank Ltd	Longonot Place, 6th Floor, Kijabe Street.	1st August 1998	10	Small
8	Chase Bank (K) Ltd.(Receivership KDIC)	17th Floor UAP Old Mutual Towers, Upper Hill, Nairobi Date Licenced:	1st April, 1996		
9	Citibank N.A Kenya	Citibank House, Upper Hill Road, Nairobi	1st July, 1974	3	Medium
10	Consolidated Bank of Kenya Ltd.	Consolidated Bank House, 6th Floor, Koinange Street.	18th December, 1989	18	Small
11	Co-operative Bank of Kenya Ltd.	Co-operative House, 4th Floor Annex, Haile Selassie Avenue.	1st July, 1968	155	Large
12	Credit Bank Limited	Mercantile House, Ground Floor, Koinange Street, Nairobi.	30th November, 1994	18	Small
13	Development Bank of Kenya Ltd.	Finance House, 16th Floor, Loita Street.	20th September, 1996	2	Small
14	Diamond Trust Bank Kenya Ltd.	DTB Centre, Mombasa Road, Nairobi.	15th November, 1994	70	Medium
15	DIB Bank Kenya Limited	Upper Hill Building, Bunyala, Lowerhill Road Junction, Upper Hill, Nairobi	13th April 2017	5	Small
16	Ecobank Kenya Ltd	Fortis Office Park – Off Waiyaki Way, Muthangari Drive, Nairobi.	16th June, 2008	18	Medium
17	Equity Bank Kenya Limited	Equity Centre,9th Floor, Hospital Road, Upper Hill	28th December 2004	178	Large
18	Family Bank Limited	Family Bank Towers, 6th Floor, Muindi Mbingu Street, Nairobi	1st May 2007	91	Medium
19	First community Bank Limited	Mezzanine 1, FCB Mirhab Building, Ring Road, Kilimani, Nairobi	29th April, 2008	18	Small
20	Guaranty Trust Bank (K) Ltd	Sky Park Plaza, Woodvale Close, Westlands, Nairobi.	13th January, 1995	9	Medium

21	Guardian Bank Ltd	Guardian Centre, Biashara Street	20th December 1995	19	Small
22	Gulf African Bank Limited	Gemina Insurance Plaza, Kilimanjaro Avenue, Upper Hill, Nairobi	1st November 2007	18	Small
23	Habib Bank A.G Zurich	Habib House, Koinange Street. Nairobi	1st July, 1978	4	Small
24	I & M Bank Ltd	1 Park Avenue, First Parklands Avenue, Nairobi.	27th March, 1996	41	Large
25	Imperial Bank Limited (Receivership by KDIC)	17th Floor UAP Old Mutual Towers, Upper Hill, Nairobi	8th January, 1996		Medium
26	Kenya Commercial Bank Ltd	Kencom House, 8th Floor, Moi Avenue.	1st January 1896	198	Large
27	Kingdom Bank Limited	Argwings Kodhek Road, Kilimani Nairobi.	2nd March, 2010	27	Small
28	Mayfair CIB Bank Limited	KAM House, Mezzanine Floor, Opposite Westgate Mall, Mwanzi Road, Westlands	20th June 2017	6	Small
29	Middle East Bank (K) Ltd	Mebank Tower, Milimani Road.	28th November, 1980	4	Small
30	M-Oriental Bank Limited	Finance House, 7 Koinange Street, Nairobi	8th February, 1991	8	Small
31	National Bank of Kenya Ltd	National Bank Building, 2nd Floor, Harambee Avenue.	1st January, 1968	79	Medium
32	NCBA Bank Kenya PLC	NCBA Centre, Mara/Ragati Road, Upper Hill, Nairobi	5th November 2019	60	Large
33	Paramount Universal Bank Ltd	Sound Plaza Building, 4th Floor, Woodvale Grove, Westlands	5th July, 1995	7	Small
34	Prime Bank Ltd	Prime Bank Building, Chiromo Lane/Riverside Drive Junction, Westlands	3rd September, 1992	20	Medium
35	SBM Bank Kenya Limited	Riverside Mews, Riverside Drive, Nairobi	1st April, 1996	45	Small
36	Sidian Bank Limited	7th Floor K-Rep Centre, Wood Avenue, Kilimani, Nairobi.	23rd March, 1999	42	Small
37	Spire Bank Ltd	Mwalimu Towers, Hill Lane, Upper Hill, Nairobi.	23rd June, 1995	12	Small
38	Stanbic Bank Kenya Limited	Stanbic Bank Centre, Westlands Road, Chiromo	1st June 2008	25	Medium
39	Standard Chartered Bank Kenya Ltd	Standard Chartered Building, Westlands Road, Chiromo Lane, Westlands	1910	31	Large
40	UBA Kenya Bank Limited	Apollo Centre, 1st Floor, Ring Road/Vale Close, Westlands	25th September, 2009	3	Small
41	Victoria Commercial Bank Ltd	Victoria Towers, Mezzanine Floor, Kilimanjaro Avenue, Upper Hill	11th January, 1996	5	Small

Appendix VIII EPRA Service Charter

Energy & Petroleum Regulatory Authority

CITIZENS' SERVICE DELIVERY CHARTER

EPRA is committed to facilitating access to sustainable energy by applying leading, universal energy regulatory practices

ELECTRICITY

SERVICE	REQUIREMENTS	USER CHARGES IN KENYA SHILLINGS				TIMELINE
Issuance of licenses to Electrical Workers	Application via the EPRA website. Attach copies of academic and professional certificates and payment receipt(s) of requisite charges	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 60 days
		A1	1,000	5,000	2,000	
		A2	1,000	5,000	2,000	
		B	750	3,000	1,000	
		C1	500	2,000	750	
		C2	250	1,000	500	
Issuance of licenses to Electrical Contractors	Application via the EPRA website. Attach details of licensed Electrical Worker(s), company registration documents, details of office premises, tools and equipment	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 30 days
		A1	1,000	5,000	5,000	
		A2	1,000	5,000	5,000	
		B	750	3,000	3,000	
		C1	500	2,000	2,000	
		C2	250	1,000	1,000	
Issuance of licenses to generation, transmission, distribution and supply of electrical energy	Materially complete application via the EPRA website and submission of three hard copies to EPRA offices	Nature of undertaking	Grant Fee	Annual fee, modification or transfer fee		Within 60 days
		Application fee	Application fee of KES. 10,000			
		Generation	10,000/= per MW	5,000/= per MW		
		Transmission	2,000/= per MW	1,000/= per MW		
		Distribution and/or supply	1,000/= per GWh	1,000/= per GWh		
		Generation, Distribution and/or supply	20,000/= per MW	10,000/= per MW		
		Electricity Supply	1,000/= per GWh	500/= per GWh		

RENEWABLE ENERGY

SERVICE	REQUIREMENTS	USER CHARGES IN KENYA SHILLINGS				TIMELINE
Issuance of licenses to Energy Auditors	Application via the EPRA website. Attach copies of academic and professional certificates and at least 5 energy audit reports.	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 60 days
		A	Free of Charge	Free of Charge	Free of Charge	
		B	Free of Charge	Free of Charge	Free of Charge	
Issuance of licenses to Energy Audit Firms	Application via the EPRA website. Attach details of licensed Energy Auditor(s), company registration documents, details of office premises, tools and equipment	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 30 days
		A	Free of Charge	Free of Charge	Free of Charge	
		B	Free of Charge	Free of Charge	Free of Charge	
Issuance of licenses to Solar Photovoltaic Technicians	Application via the EPRA website. Attach copies of academic and professional certificates	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 60 days
		T1	250	1,000	500	
		T2	500	2,000	750	
		T3	750	3,000	1,000	
Issuance of licenses to Solar PV Contractors/Vendors/ Manufacturers.	Application via the EPRA website. Attach details of licensed Solar PV technician, office premises and company registration documents	Class	Application Fee	Grant Fee	Annual Renewal Fee	Within 30 days
		C1	500	1,000	1,000	
		V1	1,000	2,500	1,000	
		V2	2,000	5,000	2,500	
Issuance of labels for energy efficient appliances	Duly filled online application via EPRA website, test report and a test certificate from an accredited laboratory	Appliance	Application Fees			Within 30 days
		Self-ballasted lamps	3,000			
		Double Capped Fluorescent Lamps	3,000			
		Ballasts for Fluorescent Lamps	3,000			
		Refrigerating Appliances	5,000			
		Non-Ducted Air Conditioners	10,000			
		Three-Phase Cage Induction Motors	10,000			

PROCUREMENT

SERVICE	REQUIREMENT	CHARGES	TIMELINES
Awarding of quotations	Submitted quotations	N/A	Within 30 days
Awarding of tenders	Submitted tenders	N/A	Within 60 days
Payment	Submitted invoices	N/A	Within 30 days

INFORMATION

Access to information	**Access to Information** We value your right to information and as such, we are committed to offering complete, timely and accurate information. Information is available from our head office; 1st Floor, Eagle Africa Centre, Longonot Road, Upperhill or nearest regional office. Telephone: +254 20- 2847000/200/2717675 Email address: info@epra.go.ke | Website: www.epra.go.ke	Free of Charge	Immediate
Complaints	**EPRA values and appreciates your feedback in form of complaints to help us improve our services.** Complaints can be lodged to the Authority through the following modes: **In person:** visit our head office 1st Floor Eagle Africa Centre, Longonot Road, Upperhill or nearest regional office **Telephone:** +254–20-2847000/200/2717675 **Hotline** 0709 336 000/0708 444 000 **Postal address:** P.O. Box 42681- 00100 GPO Nairobi **Email address:** info@epra.go.ke or enforcement@epra.go.ke **Website:** www.epra.go.ke If you remain dissatisfied with our services, please write to: **Office of the Ombudsman: Email complain@ombudsman.go.ke/ Postal address 20414-00200, Nairobi**	Free of Charge	Immediate

ECONOMIC REGULATION

SERVICE	REQUIREMENTS	USER CHARGES IN KENYA SHILLINGS				TIMELINE
		CLASS	APPLICATION FEE	GRANT FEE	ANNUAL RENEWAL FEE	
Compute Maximum Pump Prices for Diesel, Kerosene and Super Petrol and publish them every 15th day of every month	N/A	NIL	NIL	NIL	NIL	Monthly
Compute and Publish Electricity Pass through Costs by 10th day of every month	N/A	NIL	NIL	NIL	NIL	Monthly
Review and Approve ALL Power Purchase Agreements (PPA)	Materially complete initialed PPA	NIL	NIL	NIL	NIL	90 days
Review and approve ALL materially complete Retail electricity tariffs applications from distribution companies within the approval period (both Grid & Off-Grid)	Stakeholder consultations	NIL	NIL	NIL	NIL	90 days
Coordinate the preparation of the Least Cost Power Development Plan (LCPDP) every two years and upload the final copy on the EPRA website by 30th of July of the completion year	Endorsement by the EPRA and approval by MOE	NIL	NIL	NIL	NIL	Biennial
Coordinate the preparation of the Medium Term Plan (MTP) for the Least Cost Power Development Plan (LCPDP) every two years and upload the final copy on the EPRA website by 30th of July of the completion year	Endorsement by the EPRA and approval by MOE	NIL	NIL	NIL	NIL	Biennial
Undertake Cost of Services Studies for the electricity and petroleum sub-sectors every five years	Stakeholder consultations	NIL	NIL	NIL	NIL	Every five years

PETROLEUM AND GAS

Service	Requirement	Application Fees	Renewal Fees	Timeline
Issuance of licenses for Petroleum/ LPG Road Transportation Business	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Maximum 30 days
Issuance of petroleum/ LPG driver's certificate	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Maximum 30 days
Issuance of licenses for Petroleum/ LPG Bulk Storage Facility	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Maximum 30 days
Issuance of license for import, export, bunkering or wholesale of Petroleum/ LPG	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Within 30 days
Issuance of license for Retail of Petroleum/LPG	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Within 30 days
Amendment of license	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Within 30 days
Grant of construction permit for proposed petroleum refinery, retail dispensing station, pipeline or bulk storage facility	Application via EPRA website, attachment of all required documents as per the criteria in the website	NIL	NIL	Within 45 days