EFFECT OF PROJECT FINANCING ON PERFORMANCE OF INDEPENDENT POWER PRODUCERS IN KENYA

ESTHER IRENE WANJIKU

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DECLARATION

I declare that this is my original work and has not been presented in any other University or College for Examination or Academic purposes.

Signed: Date: **21st November 2022**

Esther Irene Wanjiku

D63/27634/2019

This project has been submitted for examination with my approval as the University Supervisor.

Signed: ____________ Date: 21/11/2022

Dr. Duncan Elly Ochieng (PhD, CIFA, CPA)

Senior Lecturer, Department of Finance and Accounting

School of Business, University of Nairobi

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LIST OF ABBREVIATIONS AND ACRONYMS

AfDB	Africa Development Bank
DFIs	Development Finance Institutions
EPRA	Energy and Petroleum Regulatory Authority
GOK	Government of Kenya
IMF	International Monetary Fund
IPP	Independent Power Producers
KenGen	Kenya Electricity Generating Company
KPLC	Kenya Power and Lighting Company
KV	kilovolts; measurement of voltage equal to 1,000 volts.
KWh	Kilo Watt hours
MOE	Ministry of Energy
MVA	Mega Volt Amperes
MW	Mega Watt
NCC	National Control Centre
NUG	Non-utility Generation
OECD	Organization for Economic Cooperation and Development
PLC	Programmable Logic Controller
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PSS	Power System Simulator
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SPV	Special Purpose Vehicle
SSA	Sub-Saharan Africa
UNFCCC	United Nations Framework Convention on Climate Change

ABSTRACT

The financing of energy projects is essential to the development of infrastructure. Because governments' activities are becoming increasingly diverse and because governments can no longer serve as the exclusive source of funding for infrastructure projects, a variety of alternative methods of financing infrastructure development are now being used worldwide. Project financing has increasingly become a preferred model of financing for many infrastructure projects in the energy sector. The aim of this study was therefore to investigate the effect of project financing on the performance among IPPs in Kenya. The study is guided by the resource dependency theory, frank knight's risk bearing theory, and modern portfolio theory. A descriptive survey research design was adopted with 5 IPPs in Kenya as the target population and analyzed variables including plant availability, plant capacity, energy generated, capital expenditure, annual operation expenditure, cost of debt, capital structure and capacity factor. The study findings showed how variables affect performance showing that at ceteris paribus; one unit change in plant capacity, OPEX, log of Energy generated, Capital structure and cost of debt lead to an increase in the performance of the project by 0.04%, 0.005%, 0.3424%, 0.0129%, 33.2089%. Separately, one unit change in plant availability, CAPEX, capacity factor leads to a decrease in project performance by 4.02%, 0.8057%, 0.5921%. The findings showed that out of all factors analyzed, cost of debt has the most positive effect on project performance. This shows that a firm that uses project financing realizes better returns due to the huge tax savings on interest on debt. Project financing, can therefore be concluded to be the most effective financing model as it consists of more debt than equity and as shown in the results and has better effect on profitability of an IPP. The study recommended that IPP project investors should be encouraged to adopt project financing as it promotes performance mainly through tax savings. The Government, through the Regulator can embark on providing incentives to project financing as a model of financing for capital intensive projects.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The financing of energy infrastructure is essential to the development of all other infrastructure (Atmo et al., 2015). Because governments' activities are becoming increasingly diverse and because governments can no longer serve as the exclusive source of funding for infrastructure projects, a variety of alternative methods of financing infrastructure development are now being used worldwide. Project financing has increasingly become a preferred model of financing for many infrastructure projects in the energy sector. Hence, this study will aim at investigating the effect of project financing on the performance among Independent Power Producers in Kenya. The study is guided by the resource dependency theory, frank knight's risk bearing theory, and capital asset pricing theory. The study will conduct descriptive and inferential statistical analysis and adopt a regression analysis model to examine the effect of project financing, along with other factors on performance of IPPs. This study will remain significant to policy makers, government of Kenya, regulatory and stakeholder players in the energy sector, academicians and researchers into the project financing, renewable energy and independent power generation, and general project performance in Kenya and globally.

Christophers (2022) notes that due to the fact that the use of water and land for energy infrastructure is a sovereign right, PPP projects are commonly used. Such a private-sector project can be launched in collaboration with the public sector. As a corollary, governments in developing countries are enacting policies that welcome and even promote private sector involvement in the construction of infrastructure. When infrastructure is privatized, the private sector is given the chance to help pay for, plan, and carry out projects that help build new public infrastructure. Most African countries need more access to electricity to support economic growth and provide universal access. New power generation capacity has traditionally been financed by governments and public utilities.

Availability of financing is one of the main factors that affects procurement of IPPs in Sub Saharan Africa. In order for Kenya to realize the 100% renewable energy goal by 2030, there needs to be additional investment in IPPs. Hence, this study will be centered on the effect project financing has on IPP performance in Kenya. Project financing has helped many project companies raise huge amounts of capital and enjoy benefits that come along with project financing such as the non-recourse nature, structured risk allocation, better profitability due to tax deductions arising from interest on loans by project lenders, enhanced equity returns due to higher leverage. Other factors affecting performance will also be looked at but of particular interest in the financing model.

1.1.1 Project Financing

For the foreseeable future, both emerging and developed nations are expected to rely on project finance as a means of generating huge quantities of cash. For industries that rely heavily on capital, this kind of financing may be used to construct and operate a single facility, or to refinance an existing one, using a mix of equity, debt, and credit enhancement (Fight, 2006).

Forecasting is the centre of project financing techniques as credit appraisals and debt terms are based on project cash flow forecasts and not the actual value of the project assets or credit worthiness of the sponsors. (Andrew Fight, 2006). In this type of financing, a special purpose vehicle (the project company) is financed by sponsors using equity or mezzanine debt, and the lender solely considers cash flows as the principal source of loan reimbursement and assets as secondary security. Cash flow estimates are the basis of measurement of the project credit worthiness as they are more important than the real value of the project assets. (Liu et al., 2021).

Cash flows generated by the special purpose vehicle must be sufficient to cover payments for operating costs as well as service debt (capital and interest) (Amin et al., 2021).

Tarim (2022) found out that the lender's anxiety about the potential risk of non-payment of the project debt is alleviated because of the predictability of revenue flows from the project. The lender's assessment of the project's bankability is heavily influenced by this element. A lender's basis of decision on investing in a project requires that the project be bankable or the project be worthy of being security for the loan. A project's creditworthiness, future cash flow attractiveness, host country profile, and legal, political, and market climate play a role in project selection and attractiveness (Liu et al. (2021).

1.1.2 Organizational Performance

A company's performance may be defined as how well it uses its resources to accomplish its goals. What percentage of the organization's planned activities really get done. An increasing number of businesses see operational excellence as one of the most important factors in their success Core business goals are best described as the level at which all business units work together to accomplish them. Unlocking operational performance necessitates enterprises to reinvent the way they are managed, governed, and utilized throughout the enterprise in order to achieve a business with agility, efficiency, and accuracy capable of constantly outperforming its competitors. (Eberhard et al., 2018)

Companies' operational effectiveness has been measured in part by their ability to reduce waste in terms of electricity and fuel consumption, materials used, and mechanical efficiency (Eberhard et al., 2018). At the same time, Bayliss and Pollen (2021) argue that avoidance of cost overruns, delays in design, occupancy, and compliance with technical standards for safety and environmental protection are a critical measure to project performance in achieving the final goal of keeping within the project's cost budget.

Additionally, project performance is essential to maximize profitability, limit the repercussions of hazardous and uncertain occurrences in terms of accomplishing the project's objectives, and take advantage of the chances of the risky events developing. According to Kenya, Mabea et al. (2018) evidence shows that project success has been evaluated using the following metrics: project cost and quality, customer satisfaction and project timeliness.

1.1.3 Project Financing and Performance

Performance management is the process of making sure that goals are regularly met in an effective and efficient way. A good project manager is one who is able to adapt to a changing environment while also allowing each team member to manage their own areas of specialization. This 21st-century business concept is also known as "management by objectives" or "empowering knowledge employees" and can be found in forward-thinking firms.

Due to a lack of management attention to knowledge renewal and development, this value paradigm is often overlooked (Auyezkhanuly et al., 2019). The structure of a company's finances has an impact on performance and profitability of a company. A corporation's financial structure is the percentage of both short-term and long-term assets employed in a corporation based on its kind, and it can either take the form of equity capital or debt capital. A company in financial hardship due to excessive borrowing raises its risk of bankruptcy and financial devastation, whereas one with a lower debt burden has a lower risk.

In project financing, investors must do a thorough study of all the risks a project is expected to bear during the economic life of the project-created infrastructure asset. To ensure project success by the project company, critical risks must be identified, assessed and managed effectively from the beginning of the project's implementation and during cash flow forecasting. This ensures no unexpected fluctuation in forecasted cash flows hence assuring constant repayments to the lender (Elmi, 2017).

1.1.4 Independent Producers of Power in Kenya

Kenyan IPP professionals are widely recognized as the region's best. Between 1996 and 2015, the Government of Kenya was able to build 12 IPPs with a total capacity of around 1106MW and an investment of more than $2.3 billion. Currently, 22 IPPs with a total capacity of 1099MW are currently in operation (EPRA, 2022). The emergence of new independent power producers (IPPs) has spurred expansion in the country's energy sector (particularly renewable energy) over the last few years. A total of 37% of the country's electricity is produced by independent power generators. (See in *Appendix I,* a summary of the total capacity of IPPs)

As an example, Westmont and Iberafrica, two power plants that were in the pipeline in the early 2000s, relied on their individual account balances rather than an intricate financing arrangement in order to bring their plants online in the allotted 11 months. However, Tsavo Power Company was not obligated to start up its plant within 11 months, giving them time to explore other funding options. Tsavo became the first IPP project in East Africa to take up project finance (without government guarantees) which set the pace for project financing in Kenya (Eberhard et al., 2018). In recent years, deregulation, privatization, and the introduction of private funding through public-private partnerships (PPPs) have changed the preferred methods of financing for projects. Through PPPs, a large part of the funding for big projects has moved to the private sector making it more competitive hence driving down tariffs (Amin et al., 2021).

1.2 Research Problem

Among the many factors that affect a project's success or failure is the model of financing used. IPPs are capital intensive projects requiring high levels of financing ro develop and run. The model of financing used largely affects the project's future cash flows and profitability in the long run. Project financing is an efficient model of financing for infrastructure projects and has been adopted In Kenya since the early 2000s with Tsavo Power Company being the first project financed IPP (Eberhard et al., 2018). Deregulation, privatization, and the introduction of private funding has made it possible for such investments to be done in Kenya through project financing. This study seeks to determine the effect project financing has had on performance of IPPs in Kenya.

Traditionally, power generation has dominantly been controlled by state-controlled entities to meet national demand for power. Fuel based generation is the most common among both state-owned generators as well as most IPPs and the fuel adjustment levy forms the main part of tariffs. State-controlled corporations enjoy incentives such as low tax funding and subsidies enabling them quote lower tariffs to the end-users compared to IPPs (due to their financial commitments) making them less competitive. In Kenya, occasional disruptions are experienced due to load shedding caused by inability to meet peak demand due to insufficient fuel supply resulting from unpaid supplier debt and high cost of fuel especially on the part of IPPs. This study seeks to shed light on the need for renewable energy investments through IPPs in Kenya and in Africa by assessing the cost, benefits and risks associated with funding of project through project financing. Experts in risk management suggest that by identifying and analyzing threats to success, action may be taken to lessen the likelihood of project failure (Ameyaw and Chan, 2015).

In USA for instance, the purchase of grid, or public electricity generation fuel in 2018, was anticipated to cost $900 million dollars. Due to this and high cost of fuel leading to fuel-supply debt, this causes a major obstacle in generation leading to poor electricity supply and inability to meet peak demand. This can be curbed by encouraging use of renewable energy projects, developed by IPPs to enable the country to enjoy consistent electricity supply. There is need for countries such as the USA to look into models suitable for financing based that could encourage investment in Independent Power Production. (Ameyaw and Chan, 2015).

Sub-Saharan Africa as a whole has very low energy access rates, especially in rural regions. Low electrical generation lead to frequent blackouts due to inadequate power distribution especially within rural areas. Economic expansion has been a major driver of electricity demand on the continent over the years and hence need for more power generation capacity. Growth in IPPs' is highly dependent on availability of financing. The growth of the energy sector (electricity industry) has been fueled by IPPs, which have historically accounted for majority of private sector financing. Governments around the world provide the bulk of the funding for state-owned utilities while IPPs rely heavily on willing investors based on uncertain cash flow forecasts, placing them at a disadvantage (Elmi, 2017)

In Kenya, economic activities mainly include industrial, agricultural, and residential operations which rely heavily on use electricity as one of their inputs. Kenya, like many other developing countries, has traditionally relied on hydroelectric power to supply a significant portion of its national supply. As a result of the ever-changing (unpredictable) climatic patterns, however, three key occurrences have had an impact on the energy sector: an increase in electricity demand; the degradation of catchment regions; and several modifications have been implemented by the Kenyan government's Ministry of Energy to solve this situation (EPRA, 2022). There is need for further research on how to increase investment in renewable energy sources i.e., solar and wind in order to curb challenges faced due to low hydrology regimes in the country. This helps increase the reliability and efficiency of electricity distribution in the country.

This study therefore seeks to answer the question: what effect does project financing have on the performance of independent power producers in Kenya? This study will further examine other factors; alongside project financing and the effect they have on performance of an IPP.

1.3 Research Objective

The main aim of this study was to determine the effect of project financing on the performance of IPPs. Additionally, the study seeks to determine the effect and the extent to which other factors have on the performance of IPPs in Kenya.

1.4 Value of the Study

The study significantly contributed to the current knowledge of project performance and helped to raise standards for project management professionals and the industry as a whole. The study was also beneficial to policymakers in government including the regulator (Energy and Petroleum Regulatory Authority) and The Ministry of Energy. Other beneficiaries include non-government organizations, potential investors, academicians, students and researchers and the general public.

IPPs benefit from this study's analysis of the most efficient model of financing by comparing project financing to other financing models. The findings of this study could be utilized in future the regulator strengthen the revenue requirements for tariff models in future review periods. Investors and sponsors who wish to invest in Kenya's energy sector as an Independent Power Producer are also be a beneficiary of this study in decision making for financing models.

This study opened research gaps for future researchers on other areas on the effect of project financing on performance in other capital-intensive projects/ infrastructure-based projects in other industries as well as other models of financing and the effects on project performance. Additionally, this study aimed at instilling knowledge on students on independent power producers in Kenya and how financing affects their performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter summarizes the empirical data from other researchers that have carried out the similar research in this field on the performance of independent power producers (IPPs) and energy connectivity in Kenya. In this chapter, there is also a theoretical foundation, a review of the evidence, a research gap, and a conceptual framework.

2.2 Theoretical Foundation

This study is founded partly on theoretical foundations where three theories are discussed. This section discusses and reviews with relevance the resource dependence theory, frank knight's risk bearing theory, and modern portfolio theory.

2.2.1 Resource Dependence Theory

Pfeffer and Salancik (1978) developed the Resource Dependency Theory (RDT) in an effort to document the necessity of resources in an organization in order to spur performance and growth. According to the theory, every organization relies on various resources in order to keep its operations running smoothly. Therefore, firms must spend money on internal resources to ensure that they can continue operating on a daily basis (Yeo, 2013).

Pfeffer refers to resources as the foundation of power in any organization and resources required by one organization may be held by another. As a result, this demonstrates the necessity for the organization to discover and deploy these resources for its activities. The authors of Pfeffer and Salancik (1978) argue that independent organizations will need resources for part of their operations at some point and should maintain excellent relations with their neighboring organizations because of this (Ullah, 2013).

According to Pfeffer and Salancik (2007, Smerek and Denison cited), resources and power go hand-in-hand; therefore, any organization that aspires to be powerful would eventually need resources to perpetuate itself in order to maintain its power (Ullah, 2013).

2.2.2 Frank Knight's Risk Bearing Theory

Frank Knight's risk-bearing outlines the necessity for business leaders to take risks while also examining how they can lessen the consequences if those risks prove to be significant (Rejda, 2013). Frank Knight emphasized that entrepreneurship is all about risk-taking. Cantillon and Say's theory is adapted by Knight, who adds the element of risk-taking.

The project manager's primary role is to anticipate future events, and this view sees uncertainty as a factor in production. It is important to take calculated risks in order to maximize one's chances of realizing larger opportunities and seizing those opportunities before the competition heats up. To ensure the projects' productivity, several risks are encountered by the project, and others are encountered by the project manager (Rejda, 2013).

In order to mitigate the severity of these risks and transform them into project opportunities, management approaches are needed. An important aspect of a manager's ability to see more possibilities and take advantage of them is the manager's ability to handle risk and keep track of it properly, which is explained by the risk bearing hypothesis (Rejda, 2013).

2.2.3 Modern Portfolio Theory (MPT)

Modern portfolio theory (MPT) stresses the idea that risk can be known as both perils and opportunities in which the businesses aim to not avoid risks, but to look for an optimal return at an acceptable or desirable level of risk. This theory emphasizes that management is responsible in selecting investment projects at the efficient frontier which generates the highest return to the company.

Systematic risks and idiosyncratic risks are two major underlying risks in MPT. Systematic risks are uncontrollable whereas the idiosyncratic risks can be controlled by the company. Assumptions in Modern Portfolio Theory (MPT) suggest that a corporation may minimize idiosyncratic risk via portfolio diversification. Most of the investors intended to generate higher return by holding a group of assets for minimizing the risks.

According to Modern Portfolio Theory, unsystematic risk may be mitigated by diversification, since a loss in one property is likely to be offset by a profit in another asset (across asset classes, sectors, markets, and risk levels). Systematic risk however is the risk common to the entire market and hence diversification cannot lower it as all assets in the market will tend to carry this risk. (Aziz et al., 2015)

2.3 Determinants of Performance

The main determinants of performance of IPPs include; Capital structure, project cost, operation and maintenance costs, installed plant capacity, capacity factor, plant availability, technical and commercial losses (Michaelowa et al., 2021).

2.3.1 Capital Structure

Project finance has been increasingly employed for financing renewable energy projects (Michaelowa et al., 2021). Due to substantial administrative costs associated with project finance, the use is limited to large-sized projects. Project financing avoids risks through joint ownership, a greater debt level, and long-term contracts. High debt level is preferred as debt is tax-free hence an incentive for many capital-intensive projects.

In the corporate sector, the equity holder tends to opt for risky reinvestments to get the company out of trouble, whilst the debt holder tends to look forward to reducing risks and returning on debt through disposal of assets.

2.3.2 Project Cost

Klagge (2020) found out that the high risk and high capital intensity of energy projects attract project sponsors to project finance arrangements. The size of a project (project costs) dictates the funding models to be adopted i.e., equity financing and private investments, state funding, government development aid or DFIs. DFIs are a form of subsidized lending in which the borrower receives better repayment conditions in exchange for taking on certain risks (Eberhard et al., 2018). Concessional financing, they say, has a grant-aid component that may be measured by the advantageous terms of the concessional loan. When market conditions would not result in investment or if market financing was not an option, they found that concessional funds were employed. A project company ought to evaluate which financing model places the best advantage and is more desirable in its long-term profitability goal.

2.3.3 Operation and Maintenance Costs

The size of a project dictates the O&M costs expected to be incurred annually. The project company needs to ensure that the equipment is properly installed at the beginning to ensure minimized operation and maintenance costs. This can also be achieved by ensuring proper training, handling and frequent inspection of equipment. Low O&M costs consists enable the project company effectively reach financial close.

2.3.4 Installed Plant Capacity

The installed capacity of a project determines the energy generated by a project. Projects with large-sized plants will generate more and enjoy more economies of scale relating to the large size of plant. Separately, plants with higher installed capacity have more stable supply enabling them to rank higher on merit order making their overall sales higher compared to smaller plants (EPRA, 2021).

2.3.5 Capacity factor

This metric compares the amount of actual electrical energy produced during a certain time period to the maximum possible amount. Energy nerds may use it to compare power plants' dependability. A plant with a high-capacity factor signifies more reliability hence better performance and profitability.

2.3.6 Plant availability

This is an index indicating the percentage of planned production time in which a machine actually produced. High plant availability indicates the effective use of a machine translating to good performance of a project.

2.3.7 Technical commercial and losses

Losses in energy production occur inside the distribution network as a result of the overhead lines, cables, transformers, and other substation equipment used to transmit power. These may lead to inefficiency due to loss of current, slowed distribution of power hence poor performance.

Commercial losses are associated with human interventions such as incorrect metering and billing, lack of revenue collection, non-metering of connections which lead to loss by the generators as well as the off-takers. High commercial losses lead to underperformance hence losses.

2.4 Empirical Literature Review

Adeleke et al. (2021) found that the lack of a well-coordinated regulatory, legal, and contractual framework has a significant impact on project financing, as has the shifting investment climate, the liquidity crisis, political unrest, fluctuating exchange rates, and the inability of utilities and consumers to pay market-based tariffs. PPP-Project Finance’s effectiveness is impacted by a wide range of elements, including technical, financial-economic, social, political-legal, and socio-environmental risks. These dangers are crucial not only to the success of the project but also to the long-term viability of the infrastructure the project has built, as well as to the promotion and maintenance of a stable investment climate in the infrastructure sector, including energy.

In a project financing arrangement, D'Orazio and Löwenstein (2022), found that energy-specific risks such as equipment failure and unduly rapid deterioration, risk of unduly early obsolescence due to technological advancement, unexpected modifications in design parameters, unexpected hydrological changes in project site conditions, and the response of the power market are critical. The risk of overrun in cost and time, the danger of unforeseen changes in expenses and revenues during the life of infrastructure assets, currency movements, inflation, and commercial risks are also significant in project finance.

In Hourcade et al. (2021) study, private investors face these risks all the time and there isn't much they can do to mitigate them except for the addition of a few buyout methods under particular conditions. Private investors can be protected from government action by the state, for example, by covering some of the costs. Project financing risk considerations for renewable energy IPP projects make up the bulk of the financial risk. Prices and costs rising, interest rates rising, or a weak financial structure are only a few of the possible causes. Because the project coordinators have no control over their occurrence, these dangers are virtually unavoidable. This includes issues such as inadequate planning, lack of experienced and trained employees, lack of specified processes, etc., as a technical risk. Local knowledge and skills in renewable energy plant setup and operation are considered a technical risk. There are risks at all stages of a project, but they are most common during the building, operating, and decommissioning phases.

2.4.1 Global Studies

Kumar and Kumar (2021) found out that governments in Guatemala and Colombia were found to have adopted reforms mostly as a response to rising demand for electricity. As a result, they permitted the operation of independent power producers, resulting in lower energy rates, greater productivity in the production process, and overall greater efficiency in the electrical sector. Reforms might have varying effects on the price-cost margins and subsidy levels. It's arguable, however, whether or not greater efficiency is a motivator for improvement.

Eberhard et al. (2017) argue that reappraising the non-OECD nations, reforms are hindered by a restricted focus on finance, cost recovery, and rigidity in its application. In industrialized economies, the key drivers of electrical reform are economic efficiency, technological advancement, and competition. According to Pollitt (2009), this means that in order to address the root causes of the energy sector reform thoroughly, there must be a harmonious transformation across connected industries. Because the energy sector and other sectors depend on each other, this effect can easily contribute to economic growth as a whole.

According to Nygaard et al. (2017), efficiency increases aren't always the driving factor in the United States; rather, rent shifting is. This suggests that the goals of reform in developing and mature economies can differ depending on the goals and the point at which the process has arrived. By promising to improve macroeconomic and service circumstances, Nepal and Jamasb (2015) argue that changes in many nations are triggered by national collective efforts that benefit from some public support. Many other countries have implemented reform programs ranging from restructuring the industry in order to enable competition by 'unbunching' incumbent monopoly utilities into separate electricity generation, transmission and distribution and retail suppliers; addressing climate change as well as integrating and coupling power markets one of the most important goals of reform is to replace direct government regulation with "independent" or "quasi-independent" regulatory organizations.

2.4.2 Regional Studies

Bayliss and Pollen (2021) examined the rate at which energy reform was taking place in Sub-Saharan Africa and discovered that countries like Ivory Coast, Ghana, Uganda, and Kenya were among those in the developing world that had made significant strides in their electricity reforms. Since 1996, Kenya's vertically integrated power sector has been separated into generation and distribution roles, a development following the likes of the United States, Chile, England and Wales, and Norway. Electricity sector reform has been sparked by various goals in emerging and developed economies. According to a study by Dubash (2003), which examined the reforms of 115 emerging economies' electricity markets, the market-based approach to reform had quickly taken root in many economies, and financial constraints were the dominant motivator. Reforms took root more quickly in sahela nations, but they were hampered by weak reform design and strained interactions between multinational firms and governments.

Elmi (2017) in Investigating Barriers in Renewable Energy Investment in Sub Saharan Africa the study revealed that compositional analysis, risk allocation, and risk mitigation are all relevant in infrastructure investments because of the investments' highly distinctive and illiquid nature. In order to determine the acceptable compensation for such risks in an energy project with a PPP-Project Finance arrangement, an investor must do a thorough study of all risks that the project is required to bear during the economic life of the project-created infrastructure asset. Under a project finance agreement, credit risks tend to be high and lower throughout the course of the project. As a result, it is critical that such risks be identified, assessed, and managed effectively from the beginning of the project's implementation. This complicates the assessment of credit risk when financing and project liabilities are held off-balance sheet. Off-balance sheet grantors and the shifting of some of the risks from sponsors to lenders are two important advantages of infrastructure financing. The sponsors' and lenders' agreements will therefore have a substantial impact on the project if such risks arise.

According to Achieng (2018), tariffs do not, however, reflect actual costs, and a utility could experience financial trouble. In order to meet the operational and maintenance expenses, adequate funding is required. Gambia's typical distance from the grid is between 5 and 25 kilometers. Communities with little electricity demand could face transmission line costs of USD50K-100K/km. While this is a financial burden on the utility, it also creates an opening for decentralized generation via PPAs or PPPs with IPPs.

2.4.3 Local Studies

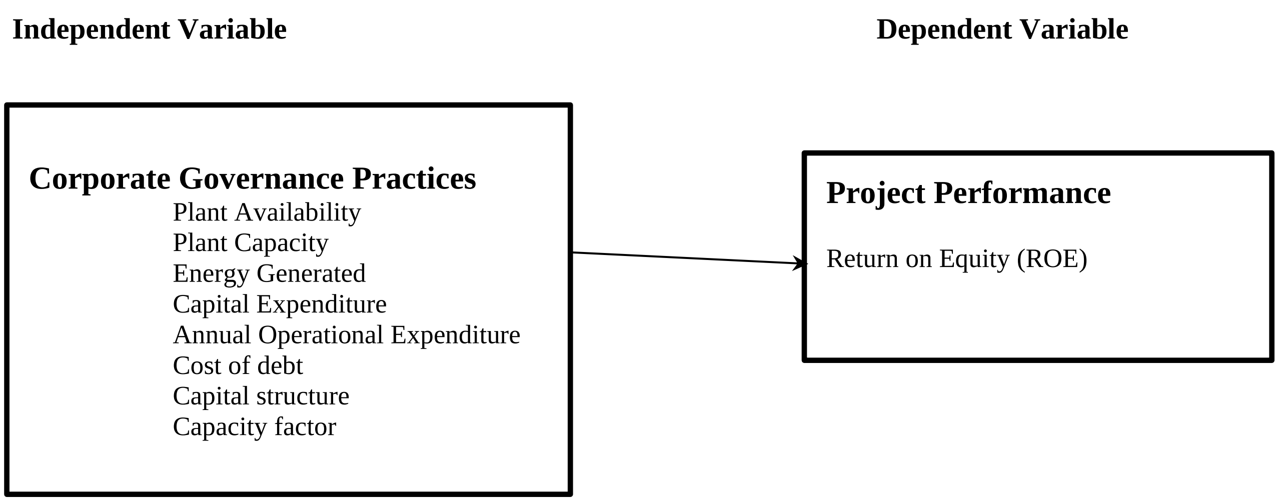
Independent power producers in Kenya have been in operation for 20 years, and Eberhard et al. (2018) analysed what that experience has taught people. It found out that a move to a market for electricity, one can expect better pricing, a wider range of options for consumers, greater efficiency in the production of electricity, and an increase in the amount of electricity we can generate.

This will, in turn, encourage more investment in the electricity sector, privatization and unbundling, as well as regulation, have been the most common reforms. In contrast, effective regulation is one of the reform's most difficult challenges. There is also a major difference in the investment requirements of developing and industrialized countries. Most reforms in emerging markets have been shaped by development partners.

Kenya's current and future electricity needs may be met by harnessing the country's abundant renewable energy resources and expanding the country's transmission infrastructure. Evidence of a tendency toward greater competition and robust plans to expand the transmission network may be found in the reform measures. For the sake of energy security, regulations have placed an emphasis on reducing consumption and promoting the use of clean, renewable energy. As a result of reforms, the number of IPPs has expanded, and the percentage of Kenyan houses connected has topped 50 percent of the entire population (Pumps Africa, 2020).

2.5 Conceptual Framework

The independent variables that were used to measure project performance include plant availability, plant capacity, energy generated, capital expenditure, annual operation expenditure, cost of debt, capital structure and capacity factor whereas the dependent variable that was used to measure project performance is return on equity (ROE). The conceptual framework is as illustrated in figure 2.1 below.



Source: Researcher (2022)

Figure 2.1 Conceptual Framework

2.6 Summary of Literature Review and Research Gaps

African nations' capacity to develop is hampered by a lack of adequate energy infrastructure. With low electrification rates and minimal investment, SSA appears to be the worst-hit region of the African continent. Investors have shied away from taking on more risk, which has pushed up the cost of capital (and returns). It is believed that DFIs can help fill in the funding gaps in public infrastructure since they are an attractive alternative to government spending. Since they have experience and ties with both governments and the private sector, DFIs can facilitate the implementation of PPPs and IPPs. Scaling up clean energy generation in Sub-Saharan Africa is considered a problem that can be solved by renewable energy IPPs. To increase investment in renewable energy in developing countries, project companies seeking financing need to structure their projects in a way that is attracting to investors with minimized commercial, macroeconomic and political risks. Governments in African countries can intervene can to promote funding by providing incentives to foreign investors can drive up investment in renewable energy.

2.6.1 Literature Summary Table

Study	Objective	Methodology	Findings	Knowledge Gaps
Sustainable utilization of energy from waste: An analysis of Waste-to-energy's opportunities and threats in South Africa (Adeleke et al., (2021)	Assess the value of trash as a potential answer to the energy and garbage management problems we're currently facing.	A qualitative study of South Africa's energy potential from waste.	Lack of financial resources and government incentives are barriers to growth in the renewable energy sector in the country	The waste-to-energy initiatives can be introduced in Kenya to curb waste management crisis.
What role should public investment banks play in mobilizing capital for renewable energy in Germany? (D'Orazio & Löwenstein, 2022)	Comparing and contrasting the United States and Germany in terms of their public financing frameworks for renewable energy.	The study sought to determine the relationship between public funding and the mobilization of private renewable energy investments.	The government is having trouble reaching its goals despite the enormous development of investments in renewable energy over the last several decades and the steady decrease of GHG emissions.	Research into the impact of public and private financing on the real estate industry.
How to rapidly and massively increase climate funding in the wake of a pandemic (Hourcade et al., 2021)	Researches the roadblock that prevents global surplus funds from being channelled into climate mitigation at an adequate rate and scale, and argues that public guarantees should be the preferable risk-sharing vehicle to overcome this roadblock.	The compatibility of the employment of AAA-rated sovereign guarantees, calibrated on an agreed-upon 'social value of carbon,' with the public-budget restrictions of industrialized nations are simulated numerically.	Project financing risk considerations for renewable energy IPP projects make up the bulk of the financial risk. Prices and costs rising, interest rates rising, or a weak financial structure are only a few of the possible causes.	Further studies on publi8c policy instruments and the reduction of up-front financial risks associated with leverage of public finance and mobilization of private investments.

Analysis of recent trends in Zambia's power industry within the context of the power paradigm (Bayliss and Pollen, 2021)	Three fundamental aspects of the country's power grid are given special attention: Zesco's efficiency, the role of the private sector, and full-cost pricing.	Both qualitative and quantitative approaches were used throughout the three parts.	The rate at which energy reform was taking place in Sub-Saharan Africa and discovered that countries like Ivory Coast, Ghana, Uganda, and Kenya had made significant strides in their electricity reforms.	The filling of infrastructure financing gaps by public or donor funds.
Finding Impediments to Renewable Energy Investment in Sub-Saharan Africa (Elmi, 2017)	Examining IPPs and FITs, two key components in breaking down electricity barriers, is essential.	Various instruments, methods and materials were used in assessing barriers in renewable energy development in sub-Saharan Africa. Selected countries were used to represent the entire sub-Saharan Africa.	The expansion of renewable energy in sub-Saharan Africa depends on reducing the current reliance on fossil fuel, reducing monopoly on state-owned utility, use of proper application of feed-in tariffs, the introduction of independent power producers through independent regulatory authorities.	Further studies on incentivization of low-income earners to move towards use of renewable energy.
Barriers to Private and Public-Private Collaboration Investment in Kenya's Renewable Energy Sector and Strategies for Overcoming Them (Achieng, 2018)	To identify the drivers of renewable energy in a developing or middle- income country like Kenya	It employed a three-stage survey approach. It focused on the context of the renewable energy investments as reflected by prevailing macro-economic conditions, electricity sector structure and project profiles.	Tariffs do not reflect actual costs, and a utility could experience financial trouble. Other factors such as O&M costs, transmission line costs could be some of the causes.	Need for further studies to look into factors affecting RE development such as environmental laws and standards, way-leave access.
What Kenya has learned from its experience with IPPs after 20 years (Eberhard et al., 2018)	Considering how Kenya's IPPs measure up to their public counterparts in terms of reliability and costs and possibilities for scale-up.	Grid connected IPPs of 5 Megawatss and more over a period of 20 years (1996-2016).	A move to a market for electricity, one can expect better pricing, a wider range of options for consumers, greater efficiency in the production of electricity. This encourages more investment in the electricity sector, privatization and unbundling, as well as regulation, have been the most common reforms.	The need for further assessing of country specific policy reforms that can help increase power generation capacity in Sub-Saharan Africa.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses how this study was carried out. Research design, sample size, and target population, are all mentioned in this document. This section also discussed the tools and methods for collecting data, as well data analysis and presentation of results.

3.2 Research Design

For this study, a descriptive survey approach was adopted. This research used a descriptive design since it was the most appropriate method for assessing the relationship between the independent and dependent variables without requiring the manipulation of those variables. For this study's purposes, the descriptive research methodology allowed for in-depth analysis as well as data collection in a highly cost-effective manner. It made it possible to generate factual data regarding the research. For this reason, a lot of the descriptive design's case development was based on secondary data, which was supported by statistics and descriptive interpretations of archival material and data.

3.3 Target Population

It is important to note that all of the IPPs presented are greenfield, grid-connected installations. A total of 5 IPPs were used as the target population and a financial reports and revenue requirements data over the last decade was gathered and analyzed (2014–2022). The published data required was obtained from The Energy and Petroleum Regulatory Authority (Attached in Appendix IV).

3.4 Data Collection

This study relied on data from previous research. For this study, populated data on the revenue requirements model for specific IPPs was obtained from The Energy and Petroleum Regulatory Authority (EPRA). Power was generated by Triumph Power, Thika Power, Lake Turkana Wind

Power, Gulf Power, and Kipeto Wind Power, five independent power producers. Data for each of the IPPs obtained and analyzed included plant availability, plant capacity, energy generated, capital expenditure, annual operation expenditure, cost of debt, capital structure and capacity factor.

3.5 Data Analysis

The research was purely quantitative and data was analyzed using descriptive statistics. This study adopted a regression model to examine the relationship between project financing and performance among IPPs where took into consideration the below measures of project financing and term of project as measure of performance among IPPs. Data panels necessitated the use of a shared effect model or pooled least squares for analysis (PLS). Time series and cross-sectional data were added into the modelling procedure. The approach can apply the Ordinary Least Square (OLS) or least squares technique for estimation.

The following common effect equation was used;

$$Y_{it} = \alpha + \beta' X_{it} + \varepsilon_{it} \ldots\ldots \text{(i)}$$

Where;

Y is the dependent variable;

x is the independent variable

i, t are indices for individual and time

i=1, 2, …, N and t = 1,2, …, T.

Suppose N is the total number of people in the sample or the number of the cross-section, and T is the total number of time points. The total number of observations is given by NxT.

Applying the Pooled Least Square (PLS) for this study, we have the following equation;

$$PP_t = \alpha + \beta_1 PA_t + \beta_2 PC_t + \beta_3 lnEG_t + \beta_4 lnCA_t + \beta_5 lnOP_t + \beta_6 CD_t + \beta_7 CS_t + \beta_8 CF_t + \varepsilon$$

Where:

α is the constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ & β_7 are Beta coefficients for the independent variables

PP_t represents Performance of the project measured in terms of ROE and efficiency

PA_t represents the Plant Availability

PC_t represents the Plant Capacity

$lnEG_t$ represents the natural log of Energy Generated

$lnCA_t$ represents the natural log of CAPEX

$lnOP_t$ represents the natural logs of Annual OPEX

CD_t represents the Cost of Debt

CS_t represents the Capital Structure

CF_t represents the Capacity Factor

ε is the error term

3.6 Tests of Significance

The output of the above regression tested:

Statistical significance using p-values. If $P>0.05$, the variable is statistically insignificant while $p<0.05$ represents statistical insignificance.

It was determined that each independent variable was correlated positively or negatively with the dependent variable based on the sign of the linear regression coefficient. A positive coefficient indicates a positive relationship between the independent and dependent variables, and a negative coefficient indicates the opposite.

The coefficient value ***(β)*** represented the amount by which the mean of the dependent variable changed in response to a change of one unit in the independent variable, with all other model variables held constant.

Additionally, the study analyzed the coefficient of determination to determine the impact of exogenous variables on the endogenous variable, thus in this study we looked at the impact of various variables on the performance of plant measured in terms of Return on Equity among all IPPs.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

In this chapter, data analysis and interpretation are done as stated out in the research objectives and methodology. The study seeks to establish the effect of project financing on the performance of independent power producers in Kenya. To establish the impact of project financing on the performance of the Independent Power Producers in Kenya, we perform a Pooled Least Square analysis.

4.2 Descriptive Statistics

Table 4.1: **Descriptive Statistics Results**

	PP	PA	PC	EG	CD	CA	CS	CF	OP
Mean	0.1647	0.8683	132.43	689,000,000.00	0.0727	220,960.10	2.8604	0.5882	15,182,729.00
Median	0.1499	0.8506	87.00	534,000,000.00	0.0737	148,333.00	2.7557	0.6194	10,921.80
Maximum	0.2253	0.9441	310.36	1,990,000,000.00	0.0798	498,940.00	3.9789	0.7035	96,444,224.00
Minimum	0.1456	0.8471	80.37	290,000,000.00	0.0653	81,832.00	2.1453	0.4175	1,548.72
Std. Dev.	0.0305	0.0367	90.06	481,000,000.00	0.0046	141,193.50	0.4448	0.0980	31,949,575.00
Observations	45	45	45	45	45	45	45	45	45

Source: E-views computation

From the table 4.1 above, we can deduce the following; the mean of performance of the project measured in terms of ROE is 0.1647 with a standard deviation of 0.0305 and the values ranging from 0.1456 to 0.2253. The mean value of Plant Availability is 0.8683 with a standard deviation of 0.0367 and the values ranging from 0.8471 to 0.9441. The Plant Capacity has a mean value of 132.43 with a standard deviation of 90.06 and the values ranging from 80.37 to 310.36. The energy generated has a mean value of 689,000,000.00 with a standard deviation of 481,000,000.00 and values ranging from 290,000,000.00 to 1,990,000,000.00. The cost of debt has a mean value of 0.0727 with a standard deviation of 0.0046 and the values ranging from 0.0653 to 0.0798. CAPEX has mean value of 220,960.10 with a standard deviation of 220,960.10 and the values ranging from 81,832.00 to 498,940.00. The mean value of Capital Structure is 2.8604 with a standard deviation of 0.4448 and the values ranging from 2.1453 to 3.9789. The mean value of Capacity Factor is 0.5882 with a standard deviation of 0.0980 and the values ranging from 0.4175 to 0.7035. The mean value of Annual OPEX is 15,182,729.00 with a standard deviation of 31,949,575.00 and values ranging from 1,548.72 to 96,444,224.00.

4.3 BCG Matrix on Profitability and Efficiency

Table 4.2: BCG Matrix

Stars	Question Marks
Cash Cows	Dogs

High

Profitability

Low

High Efficiency Low

4.4 Diagnostic Analysis

4.4.1 Panel unit root test

Table 4.3: Panel Unit Test Results

	Critical Values				
Variable Name	**Levin, Lin &Chu Level**	**Im, Pesaran and Shin W-stat Level**	**ADF – Fisher Chi-square Level**	**ADF - Fisher Chi-square**	**Comment**
CF	-7.4574*	-2.7863*	28.2936*	63.0909*	Stationary
LNCA	-3.2134*	-1.3426	17.6738	16.1171	Stationary
LNOP	6.0779	0.8515	0.2605	17.4349*	Stationary
LNEG	-0.6670	-0.9848	15.0711	22.4390*	Stationary
PP	-6.3296*	-3.3228*	30.494*	65.1034*	Stationary
PA	-2.8857*	-0.8212*	13.6225	33.0065*	Stationary
PC	-10.5784*	-4.4713*	40.6991*	35.4806*	Stationary
CS	-0.5124	-0.0552	9.1127	16.7330	Non-Stationary
CD	-4.4720*	-2.4107*	25.7006*	52.9460*	Stationary

Source: E-views computation

Note: ▯ indicate the significance at 5% level.

Based on the above table 4.2, we can conclude all variables are stationary at levels at 5 percent significance level except Capital Structure which is non-stationary at level. Therefore, we proceeded to perform the correlation analysis to establish the relationship between the respective variables and thereafter performed pooled OLS analysis.

4.5 Correlation Analysis

Table 4.4 Correlation Analysis Results

	PP	PC	PA	LNOP	LNEG	LNCA	CS	CF	CD
PP	1.0000								
PC	0.9949	1.0000							
PA	0.9957	0.9955	1.0000						
LNOP	-0.0758	-0.0924	-0.0704	1.0000					
LNEG	0.9029	0.9202	0.9020	-0.0057	1.0000				
LNCA	0.7036	0.7545	0.7103	0.0581	0.8298	1.0000			
CS	0.7205	0.7106	0.7097	-0.2500	0.7210	0.3939	1.0000		
CF	-0.1933	-0.1734	-0.1969	0.2581	0.1962	0.1213	0.1262	1.0000	
CD	0.3856	0.4064	0.3860	0.6165	0.4992	0.7023	0.0936	0.2279	1.0000

Source: E-views computation

From the above table, the following can be deduced; plant performance has a positive relationship with plant capacity, log of Energy generated, Plant availability, log of CAPEX, Capital structure and cost of debt as depicted by correlation coefficient of 0.9949, 0.9029, 0.9957, 0.7036, 0.7205 and 0.3856 respectively. While on the other, the performance of project has a negative relationship with log of annual OPEX and capacity factor as depicted by correlation coefficients -0.0758 and -0.0758 respectively. Plant capacity is positively related with Plant availability, log of Energy Generated, log of Capex, Capital Structure, Cost of Debt as depicted by correlation coefficients; 0.9955, 0.9202, 0.7545, 0.7106 and 0.4064 respectively. While on the other hand, Plant capacity is negatively related with log of OPEX and Capacity Factor as depicted by correlation coefficients -0.0924 and -0.1734. Plant Availability is positively related with log of Energy generated, log of CAPEX, capital structure and Cost of debt as depicted by correlation coefficients; 0.9020, 0.7103, 0.7097 and 0.3860 respectively. While on the other hand, plant availability is negatively related with log of OPEX and capacity factor as depicted by correlation coefficients; -0.0704 and -0.1969 respectively.

Log of OPEX is positively related to log of CAPEX, Capacity Factor and Cost of Debt as depicted by correlation coefficients; 0.0581, 0.2581 and 0.6165 respectively. While on the other hand, the Log of OPEX is negatively related to log of energy generated and capital structure as depicted by correlation coefficients; -0.0057 and -0.0057 respectively. Log of Energy generated is positively related to log of CAPEX, Capital structure, Capacity factor and Cost of Debt as depicted by correlation coefficients; 0.8298, 0.7210, 0.1962 and 0.4992 respectively. Log of CAPEX is positively related to Capital structure, Capacity factor and Cost of Debt as depicted by correlation coefficient; 0.3939, 0.1213 and 0.7023 respectively. Capital structure is positively related to Capacity factor and Cost of debt as depicted by correlation coefficients; 0.1262 and 0.0936 respectively. Capacity factor is positively related to Cost of debt as depicted by correlation coefficient of 0.0936.

4.6 Regression Analysis

Table 4.5 Pooled OLS model results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PC	0.000369	6.74E-05	5.471185	0.0000
PA	-0.040155	0.137304	-0.292450	0.7716
LNOP	4.88E-05	0.000154	0.317546	0.7527
LNEG	0.003424	0.004301	0.795980	0.4313
LNCA	-0.008057	0.001701	-4.735413	0.0000
CS	0.000129	0.001370	0.093984	0.9256
CF	-0.005921	0.009511	-0.622584	0.5375
CD	0.332089	0.169629	1.957737	0.0580
C	0.157627	0.146391	1.076759	0.2888
R-squared	0.996311	Mean dependent var		0.164691
Adjusted R-squared	0.995491	S.D. dependent var		0.030506
S.E. of regression	0.002048	Akaike info criterion		-9.366584
Sum squared resid	0.000151	Schwarz criterion		-9.005252
Log likelihood	219.7482	Hannan-Quinn criter.		-9.231883
F-statistic	1215.256	Durbin-Watson stat		2.733069
Prob(F-statistic)	0.000000			

Source: E-views computation

The above Table represents the Pooled OLS results which can be explained as follows; the coefficient of determination which is represented by R-Squared and gives the far to which the independent variables explain the dependent variable. From the above table we note the R-Squared to be 99.63%, thus we can conclude that the independent variables explain to this extend the influence on the dependent variable. In our study we seek to establish the impact of project financing on the project performance in energy production by private producers in Kenya. Additionally, we can state that, the adjusted R-squared also explains the same effect though it incorporates the degrees of freedom in its computation. We can therefore, conclude that, by incorporating the degrees of freedom, the independent variables explain the dependent variable by 99.55%. The P-value of the F-statistic is 0.000 thus this makes the model statistically significant. Conclusively, we can deduce the following equation;

PP =0.1576+0.0004PC-0.0402PA+0.00005 LNOP+0.003424LNEG-0.008057LNCA+0.000129CS-0.005921CF+0.332089CD

4.7 Residual Cross-Section Dependence Test

Table 4.6: **Residual Cross-section Dependence Test Results**

Breusch-Pagan LM	15.61374	10	0.1112
Pesaran scaled LM	1.255270		0.2094
Pesaran CD	0.305481		0.7600

Source: E-views computation

From the above table 4.2, the P-Value for Pesaran CD is 0.7600 which is greater than 0.05 at 5 percent significance level, and thus we don’t reject the null hypothesis. We therefore conclude that there is no cross-section dependence among the observations.

4.8 Interpretation and Discussion of Results

The main objective of the study is to determine the effect of project financing on performance of such IPP projects in Kenya. In order to determine this relationship, the study used the following variables; performance of the project measured in terms of ROE, Plant Capacity, Plant Availability, Energy Generated, CAPEX, Annual OPEX, Cost of Debt, Capital Structure and Capacity Factor. The study used panel data with the following independent Power Producers; Triumph, Thika, Gulf, Lake Turkana Wind Power and Kipeto. The following equation was formed from the regression analysis;

PP =0.1576+0.0004PC-0.0402PA+0.00005 LNOP+0.003424LNEG-0.008057LNCA+0.000129CS-0.005921CF+0.332089CD

From the above equation we can conclude the following;

Plant Capacity and the log of CAPEX are statistically significant since they have P-values less than 0.05 at 5 percent significance level. Plant Availability, log of Energy Generated, Capital Structure, Cost of Debt, Capacity Factor and Log of Annual APEX are statistically insignificant since the P-Values of T-statistics are greater than 0.05 and therefore we cannot reject the null hypotheses at 5 percent significance level.

The marginal effects on the performance of project by the independent variables are explained as follows; At ceteris paribus; one unit change in plant capacity leads to 0.04% increase in the performance of the project, One unit change in plant availability leads to 4.02% decrease in the performance of the project, One unit change in the log of OPEX leads to 0.005% increase in the performance of the project, One unit change in the log of Energy generated leads to 0.3424% increase in the performance of the project . Further, at ceteris paribus, one unit change in the log of CAPEX leads to 0.8057% decrease in the performance of the project, one unit change of capital structure leads to 0.0129% increase in the performance of the project, one unit change of Capacity factor leads to 0.5921% decrease in the performance of the project. Lastly, one unit change of Cost of debt leads to 33.2089% increase in the performance of the project.

4.9 Chapter Summary

The chapter four provides the data analysis and interpretation of the results. The study applies the following variables; performance of the project measured in terms of ROE, Plant Capacity, Plant Availability, Energy Generated, CAPEX, Annual OPEX, Cost of Debt, Capital Structure and Capacity Factor.

The study used the panel data for five IPPs in Kenya for period from 2014 to 2022. The panel data analysis results shows that the project financing, along with other variables affects the performance of the project at 99.63% at 5 percent significance level. The residual cross-section dependence test confirms non-existence of cross-section dependency among the firms since the P-Value for Pesaran CD is 0.7600 which is greater than 0.05 at 5 percent significance level.

The analysis also reveals that cost of debt has the largest effect on performance as it leads to an increase in performance by 33.2089%. This can be explained by the fact that project financing is a highly leveraged model of financing which leads to tax saving as interest on leverage is tax deductible hence increasing a project’s profitability.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of study and the conclusion is made based on the econometric analysis done with their relevance and contribution to theory and practice. In addition, the chapter makes recommendations for further study and states the limitations of the study. An overview of the theoretical aspect of the study is also done.

5.2 Summary of the Findings

The study has explored the framework, the concepts of project financing and independent power producers of energy in Kenya. These framework and concepts have been explored in depth in chapter one and two and presented logically in this paper. The study undertook the literature review to identify the gap and try to bridge it by coming up with new literature based on the acquired data. The literature revealed that traditionally, power generation has dominantly been controlled by state-controlled entities to meet national demand for power. Fuel based generation is the most common among both state-owned generators as well as most IPPs and the fuel adjustment levy forms the main part of tariffs. State-controlled corporations enjoy incentives such as low tax funding and subsidies enabling them quote lower tariffs to the end-users compared to IPPs (due to their financial commitments) making them less competitive.

In Kenya, occasional disruptions are experienced due to load shedding caused by inability to meet peak demand due to insufficient fuel supply resulting from unpaid supplier debt and high cost of fuel especially on the part of IPPs. Over the past 2 decades, project financing has helped many project companies raise huge amounts of capital and is increasingly becoming the preferred financing model of financing due to its non-recourse nature, tax savings, better equity returns. The study was undertaken to determine the effect of project financing on performance of IPPs. Other factors affecting performance were also be looked at but of particular interest was the model of financing. The following factors were included in the study; Plant Availability, Plant Capacity, Cost of Debt, Capital Structure, Capacity Factor, Energy Generated, Annual CAPEX and Performance of the Project measured in terms of ROE.

The pooled OLS analysis results as portrayed by the table 4.2 shows that the independent variables explain 99.63% effect on the dependent variable. Additionally, the P-value (0.0000) is less than 0.05 at 5 percent significance level makes the model statistically significant. Thus, we can conclude that the project financing affects the performance of the project especially in the Independent Power Producers as portrayed by the study.

The results also show that cost of debt has the largest effect on performance as it leads to an increase in performance by 33.2089%. This can be used to explain that higher leverage leads to better and higher profitability of a project which is essentially the reason why project financing is the most preferred financing model for capital intensive projects. This is because project financing is mostly categorized by 70% debt financing hence high interest payments. Interest is tax deductible meaning such projects highly benefit from tax savings.

5.3 Conclusions

The main objective of the study is to determine the effect of project financing on performance of such IPP projects in Kenya. In order to determine this relationship, the study used the following variables; performance of the project measured in terms of ROE, Plant Capacity, Plant Availability, Energy Generated, CAPEX, Annual OPEX, Cost of Debt, Capital Structure and Capacity Factor. The study used panel data with the following independent Private Producers; Triumph, Thika, Gulf, Lake Turkana Wind Power and Kipeto.

The study used the panel data for five IPPs in Kenya for period from 2014 to 2022. The panel data analysis results shows that the project financing affects the performance of the project at 99.63%

at 5 percent significance level. Additionally, the residual cross-section dependence test confirms non-existence of cross-section dependency among the firms since the P-Value for Pesaran CD is 0.7600 which is greater than 0.05 at 5 percent significance level.

Based on the analysis, we can also conclude that the capital structure of a project is the greatest determinant of the project's performance. Projects should strive to ensure an optimal capital structure of higher debt to equity (Optimally 70:30) as this is would help reduce the risk to equity investors, increase equity returns and lower tax burden on leverage. Project financing consists of more debt than equity and as shown in the results, has a better effect on profitability.

5.4 Recommendations

Based on the panel data analysis results, it is clear the various project financing determinants have positive and negative effects on the project performance. For instance, plant capacity and annual CAPEX are statistically significant in the model. Plant capacity has a positive effect on the project performance while the annual CAPEX has a negative effect on the project performance. The managers of IPPs should be concerned with the plant capacity expansion in order to increase the performance of the project while on the other hand they should limit the annual CAPEX in order to reduce its adverse effects on the project performance.

The study has revealed that higher debt means more tax savings on a project. The Regulator (EPRA) could embark on encouraging IPP project investors to adopt project financing by making it a requirement during the submission of their revenue requirements model and during application for tariffs. This can be done by setting out a capital structure requirement to ensure compliance by the IPPs.

It is important that better management of power plants by encouraged by managers of IPPs through continued trainings to employees on operation of machinery, more frequent maintenance of machinery and equipment to prevent high annual operation and maintenance costs. This also helps to reduce instances of obsolescence of machines hence preventing the project from losses caused by early retiring and decommissioning before the term of the project lapses which has been the case for certain power projects.

5.5 Limitations of the Research

Data availability for this study was a limitation. Most of the independent power producers are private companies who often do not publish their financial statements publicly. Additionally, some of the data for this study is either confidential and is only held by the regulator (EPRA) hence acquiring this data was a constraint.

Due to the length of the period of study, data from earlier years was not obtainable. The research covered a period of 8 years beginning 2014-2022 as most of the submissions by IPPs was done manually and hence tracing these records and filing records was a huge and tedious task. Additionally, most of the IPPs have been commissioned in the range of years between 2012-2021 after which the Government placed a temporary hold on new IPP applications through a me moratorium.

This study was also limited to the variables of study for which data was available. Based on the data provided the study was not able to study variables such as technical and commercial losses as data on this was unavailable for this study. Separately, availability of efficiency measure variables was difficult to obtain in this study.

5.6 Suggestions for further research

The study applied pooled OLS analysis model in determining the effect of project financing on the project performance for IPPs in Kenya. I would recommend further study to be done and the researcher to use Fixed Effect and Random Effects modelling to determine the relationship between the project financing and project performance for IPPs in Kenya.

Other researchers can further research on other models of financing such as corporate financing, concessional financing and the effect of these models on performance of IPPs in Kenya. This would provide a basis for comparison to show which model leads to better performance in terms of profitability and inform investors as well as stakeholders who may have interest in IPP projects in Kenya.

Lastly, researchers can study the effect of project financing on performance in projects in other sectors/ industries that are infrastructure based and are capital intensive. This would help broaden and further determine if project financing has the same effect on performance in other capital projects as it does on power projects as confirmed by this study.

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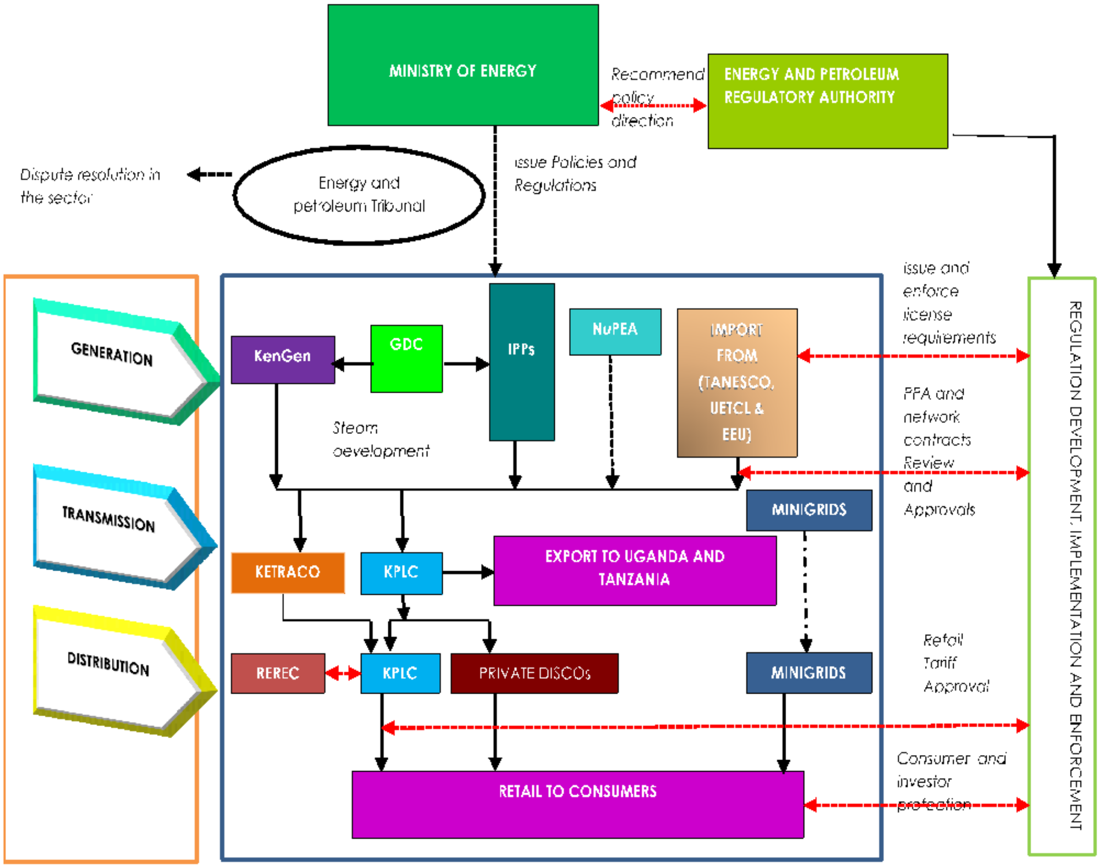
APPENDICES

Appendix I: Independent Power Producers in Kenya

PLANT NAME	INSTALLED CAPACITY	CONTRACTED CAPACITY
Iberafrica Diesel	52.5	52.5
Tsavo Diesel	0	0
Biojoule Kenya Limited	2	2
Mumias – Cogeneration	0	0
OrPower 4 -Geothermal (1st plant)	63.8	63.8
OrPower 4 -Geothermal (2nd plant)	39.6	39.6
OrPower 4 -Geothermal (3 rd plant)	17.6	17.6
OrPower 4 -Geothermal (4th plant)	29	29
Rabai Diesel	90	88.6
Thika Diesel	87	87
Gulf Diesel	80.32	80.32
Triumph Diesel	83	83
Imenti FiT hydro	0.283	0.283
Gikira FiT hydro	0.514	0.514
Genpro Teremi Falls	5	5
KTDA Gura	2	2
KTDA Chania	0.5	0.5
KTDA Metumi(North Mathioya)	3.6	3.6
Strathmore Solar	0.25	0.25
Lake Turkana Wind Power	310	300
Garrissa Solar	50	50
Kipeto Wind	100	100
Selenkei Solar	40	40
Cedate Solar	40	40
Kianthumbi Small hydro	0.51	0.51
Malindi Solar Group	40	40
IPP Total	**1,137**	**1,126**

Appendix II: Visual Representation of the Structure of the Kenyan Electricity Sector



Appendix III: Installed Capacity as at December 2021

Generation Type	**21-Dec**	
	Installed MW	**Effective MW**
Hydro	838	809
Geothermal	863	805
Thermal (MSD)	586	566
Temporary Thermal -grid	0	0
Thermal (GT)	60	56
Wind	436	426
Biomass	2	2
Solar	170	170
Interconnected System	2,955	2,834
Off grid thermal	31	21
Off grid Solar	2.26	1.9
Off grid Wind	0.55	0
Imports	-	-
Total Capacity MW	2,990	2,858

Source: EPRA (2022)

Appendix IV: Raw Data

Year	IPP	Performance (ROE, Cost of Equity Shareholder loan)	LN CAPEX	LN Annual OPEX	Cost of Debt	Capital Structure (Ratio of Debt to Equity)	LN Energy Generated	Plant Capacity	Capacity factor	Plant Availability
2014	Triumph	14.99%	11.89	17.06	7.71%	2.59	19.98	82.99	65.09%	85.21%
2015	Triumph	15.01%	11.91	18.05	7.89%	2.62	19.98	83.01	64.89%	84.87%
2016	Triumph	14.89%	11.91	18.10	7.55%	2.64	19.98	82.89	65.29%	84.98%
2017	Triumph	14.90%	11.90	18.15	7.49%	2.51	19.99	82.73	64.78%	85.02%
2018	Triumph	14.72%	11.91	18.19	7.79%	2.58	19.98	83.42	65.19%	84.71%
2019	Triumph	15.11%	11.91	18.24	7.65%	2.55	19.97	82.58	64.85%	84.98%
2020	Triumph	14.75%	11.89	18.29	7.70%	2.53	19.97	82.65	65.35%	85.29%
2021	Triumph	15.21%	11.91	18.34	7.50%	2.65	19.99	83.35	64.69%	85.37%
2022	Triumph	14.95%	11.89	18.38	7.85%	2.61	19.99	83.00	64.98%	84.78%
2014	Thika	14.85%	11.58	7.35	6.83%	3.14	20.09	87.25	70.01%	85.09%
2015	Thika	14.97%	11.59	7.36	6.73%	2.90	20.09	86.89	69.97%	85.18%
2016	Thika	15.35%	11.57	7.38	6.86%	2.80	20.10	86.69	70.21%	84.97%
2017	Thika	15.15%	11.56	7.40	6.58%	3.37	20.10	87.15	69.89%	84.76%

Year	IPP	Performance (ROE, Cost of Equity Shareholder loan)	LN CAPEX	LN Annual OPEX	Cost of Debt	Capital Structure (Ratio of Debt to Equity)	LN Energy Generated	Plant Capacity	Capacity factor	Plant Availability
2018	Thika	14.65%	11.58	7.42	6.53%	3.10	20.10	87.37	70.35%	85.31%
2019	Thika	15.41%	11.57	7.44	6.93%	3.40	20.10	86.97	69.78%	84.92%
2020	Thika	14.73%	11.58	7.46	6.76%	3.00	20.10	86.78	70.18%	85.08%
2021	Thika	15.25%	11.58	7.48	7.03%	3.31	20.11	87.00	69.69%	84.75%
2022	Thika	14.84%	11.59	7.50	6.71%	3.00	20.09	87.09	69.98%	84.87%
2014	Gulf	15.31%	11.35	8.17	6.79%	2.36	19.50	81.32	42.45%	85.33%
2015	Gulf	14.76%	11.38	8.19	6.73%	2.46	19.50	80.37	41.98%	84.79%
2016	Gulf	15.12%	11.37	8.21	6.83%	2.76	19.50	82.92	41.78%	85.00%
2017	Gulf	15.43%	11.36	8.23	6.70%	2.56	19.51	83.72	42.25%	85.04%
2018	Gulf	14.81%	11.39	8.25	6.69%	2.86	19.49	82.02	41.75%	84.96%
2019	Gulf	14.79%	11.34	8.27	6.80%	2.30	19.51	80.92	42.37%	84.98%
2020	Gulf	14.69%	11.31	8.29	6.75%	2.16	19.52	81.62	41.89%	84.94%
2021	Gulf	14.86%	11.33	8.31	6.72%	2.66	19.49	82.42	42.08%	85.43%
2022	Gulf	14.99%	11.40	8.33	6.81%	2.96	19.49	84.52	41.90%	84.78%

Year	IPP	Performance (ROE, Cost of Equity Shareholder loan)	LN CAPEX	LN Annual OPEX	Cost of Debt	Capital Structure (Ratio of Debt to Equity)	LN Energy Generated	Plant Capacity	Capacity factor	Plant Availability
2014	LTWP	22.45%	13.01	9.96	7.57%	3.38	21.19	310.07	55.43%	94.41%
2015	LTWP	22.49%	12.96	9.99	7.77%	3.68	20.98	310.36	54.97%	94.09%
2016	LTWP	22.51%	13.03	10.02	7.67%	3.48	21.06	309.69	55.21%	94.38%
2017	LTWP	22.45%	13.06	10.05	7.87%	3.78	21.25	309.89	54.78%	93.89%
2018	LTWP	22.47%	13.02	10.08	7.97%	3.58	21.12	310.31	54.89%	93.69%
2019	LTWP	22.52%	13.00	10.11	7.27%	3.98	21.31	309.98	55.38%	93.79%
2020	LTWP	22.53%	12.94	10.14	7.37%	3.08	21.36	310.21	55.05%	94.36%
2021	LTWP	22.48%	12.92	10.17	7.47%	3.28	20.90	310.19	54.90%	94.07%
2022	LTWP	22.50%	13.12	10.20	7.59%	3.18	21.41	310.02	54.69%	93.87%
2014	Kipeto	14.78%	12.66	9.18	7.38%	2.65	20.11	99.84	61.98%	85.06%
2015	Kipeto	15.11%	12.67	9.21	7.48%	2.35	20.11	100.24	62.07%	84.82%
2016	Kipeto	14.93%	12.68	9.24	7.88%	2.85	20.11	99.95	61.85%	85.43%
2017	Kipeto	14.77%	12.65	9.27	7.28%	2.75	20.12	99.59	61.78%	85.36%
2018	Kipeto	15.15%	12.64	9.30	7.58%	2.45	20.12	99.89	62.34%	84.75%

Year	IPP	Performance (ROE, Cost of Equity Shareholder loan)	LN CAPEX	LN Annual OPEX	Cost of Debt	Capital Structure (Ratio of Debt to Equity)	LN Energy Generated	Plant Capacity	Capacity factor	Plant Availability
2019	Kipeto	14.74%	12.68	9.33	7.68%	2.95	20.12	100.01	61.89%	85.19%
2020	Kipeto	14.97%	12.70	9.36	7.18%	2.65	20.12	99.68	61.67%	84.78%
2021	Kipeto	15.21%	12.69	9.39	7.98%	2.25	20.11	99.99	62.39%	85.09%
2022	Kipeto	14.56%	12.67	9.42	7.08%	2.15	20.12	99.79	61.94%	84.74%

PIVOT TABLE SHOWING RELATIONSHIP AMONG IPPS IN TERMS OF EFFICIENCY AND PROFITABILITY

IPP	Sum of PA	Sum of PP
Gulf	7.6525	1.3476
Kipeto	7.6522	1.3422
LTWP	8.4655	2.0240
Thika	7.6493	1.3520
Triumph	7.6521	1.3453
Grand Total	39.0716	7.4111