RURAL ELECTRIFICATION EXPANSION STRATEGIES, PROJECT CONTROL MECHANISMS AND IMPLEMENTATION OF ENERGY ACCESS PROJECTS IN UNDERSERVED COUNTIES IN KENYA.

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Doctor of Philosophy in Project Planning and Management of the University of Nairobi

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DECLARATION

This Thesis is my original work and has never been submitted for an academic award in any other University.

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DEDICATION

This Thesis is dedicated to my spouse Mercy Kituzi for her constant and unwavering motivation, encouragement, immeasurable love and affection, moral and financial support which they tirelessly extended to me. Her cherished inspiration and support were instrumental in the thesis completion.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	-	Asian Development Bank
CRA	-	Commission on Revenue Allocation
EPC	-	Engineering, Procurement and Construction
ESMAP	-	Energy Sector Management Assistance Program
GDC	-	Geothermal Development Company Limited
GoK	-	Government of Kenya
LDC	-	Least Developed Countries
IEA	-	International Energy Agency
IOU	-	Investor Owned Utilities
KOSAP	-	Kenya off Grid Solar Access Project
LDC	-	Least Developed Countries
MW	-	Mega Watt
NGO	-	Non-Governmental Organization
ODA	-	Official Development Assistance
PMI	-	Project Management Institute
PPP	-	Public Private Partnership
PV	-	Photovoltaic
REA	-	Rural Electrification Authority
SDG	-	Sustainable Development Goals
SE4ALL	-	Sustainable Energy for ALL
SME	-	Small and Medium Sized Enterprises
UN	-	United Nations
UNCTAD	-	United Nations Conference on Trade and Development
UNDP	-	United Nations Development Programme
USAID	-	United States Agency for International Development

ABSTRACT

The study examined the rural electrification expansion strategies, project control mechanisms and implementation of energy access projects among rural households in underserved counties in Kenya. Specific objectives were to: examine the extent to which project planning influence implementation of rural energy access projects in underserved counties in Kenya, establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya, determine the extent to which project fund mobilization influence the implementation of rural energy access projects in underserved counties in Kenya, examine the extent to which project company influence the implementation of rural energy access projects in underserved counties in Kenya, establish the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya, establish the extent to which project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya and establish the extent to which project control mechanisms moderates the relationship between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in Kenya and were anchored on stakeholder theory, theory of constraints and ladder of participation theory. The study adopted pragmatism approach and descriptive and correlational research design. A total of 373 respondents were picked from 5,604 residents in underserved counties in Kenya through stratified sampling and purposive sampling techniques. Interviews, observation and questionnaires were utilized to collect the data from the respondents. The R^2 and F-test was utilized to test the hypotheses. The results were project planning ($R^2 = 0.042, F = 4.399 (p < 0.05)$, project service outsourcing (($R^2 = 0.064, F = 6.842 (p < 0.05)$, project fund mobilization ($R^2 = 0.148, F = 17.239 (p < 0.05)$ had significant influence on the implementation of energy access projects in underserved counties in Kenya and therefore the null hypothesis was rejected while project company ($R^2 = 0.003, F = 0.336 (p > 0.05)$ had insignificant influence on the implementation of energy access projects in underserved counties in Kenya and the study failed to reject the null hypothesis. The combined rural electrification expansion had statistically significant influence on implementation of energy project performance in underserved counties ($R^2 = 0.139$, $F = 11.942 (p < 0.05)$, which led to the null hypothesis being rejected. Project control mechanisms significantly influenced the implementation of energy access ($R^2 = 0.065$, $F = 6.896 (p < 0.05)$, thereby rejecting the null hypothesis. Project control mechanism significantly moderated the relationship between rural and implementation of energy access projects in underserved counties in Kenya ($R^2 = 0.142$, $F = 9.821 (p < 0.05)$. Particularly, the correlation coefficient, increased from 37.2% to 37.7%, the R^2 increased from 13.9% to 14.2%, which was an improvement of 0.3%. Thus, the null hypothesis was rejected. In conclusion, the study findings provided evidence that for increased implementation of energy access projects in underserved counties in Kenya, rural electrification expansion strategies should be comprehensively formulated, and regulatory policy frameworks instituted. Thus, the study's findings would help all stakeholders to identify suitable business models that would be beneficial to decentralized alternative sources of energy. The study thus recommends that there was need for developing appropriate infrastructures that could support rural electrification energy systems and training local communities in areas related to operation and maintenance of rural electrification systems. Further, it also recommended that further studies need to be done to interrogate the causes of disparities in rural electrification expansion strategies on the implementation of energy access projects.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Access to energy plays a vital role in fostering socio - economic development. The World Bank acknowledges that no single country is able to reduce poverty significantly without ensuring that majority of its citizens have access to energy (Saghir, 2005). Access to energy is able to promote economic development, gender equality, water and sanitation as well as education among other things that relate to development. As regards education, it enhances educational outcomes by improving the learning conditions including allowing students to access technology within their schools. With regard to public health, it enables hospitals to install medical equipment such as refrigerators that are important for refrigerating vaccines, medicines, blood, and providing lighting for medical services to be offered even at night. Economically, it reduces the amount of money that families spend on paraffin, promotes enterprise development and increases the rate of energy connectivity and even competitiveness. These achievements may extend to empowering women to the extent of reducing gender disparity. Besides, access to energy enables the members of the public to improve their ways of life, participate in global markets and ultimately contribute to economic development at local levels (Terri and Neha, 2015).

Projects are regarded as successful if they are delivered on time and within acceptable quality levels. Crawford and Bryce (2013) observe that projects may be regarded as successful if only they are completed on schedule, within budgets, they achieve desired objectives as set out right from the beginning and above all they are accepted and used by clients they were designed for. Clark, (2009) on the other hand observes that project success is measured differently by different people and that the level of satisfaction among different groups of stakeholders is a major factor in determining their success.

The Chinese and Vietnamese governments experienced economic growth as soon as they promoted rural electrification in their countries (Do Phu Tran Tinh., 2012). According to World Bank (2017) report, Vietnam's support of rural electrification resulted in remarkable

economic growth and development and even managed to transform the country into a middle-income one. As a result, Vietnam has become a dynamic national in East Asian region. In India an energy access project by the Ministry of New and Renewable Energy (MNRE), indicated that a weak implementation capacity was able to affect negatively the implementation of those projects even in the presence of project control mechanisms (Rawat, 2013). Similarly, an evaluation report on the implementation of the projects prepared by the African Development Bank (2012) on Rural Electrification in Ghana showed that project implementation was marred by cost overruns and delays in delivery. Nonetheless, some of these problems could have been avoided if there was effective project management during the execution of the project (Dramani and Tewari 2014). According to a study by Kemausuor and Ackom, (2017), project overruns is still common in most energy access projects and that they are being attributed to poor rural electrification expansion strategies and poor project management and thus there is need to establish the extent to which rural electrification expansion strategies influence project implementation.

An analysis report by the African Development Bank (AfDB, 2012) on the implementation of projects revealed that unreliable services, low power consumption, high costs, limited electrification and inadequate power generation capacity were the main challenges facing power sector in Africa. Policy and regulatory challenges that relate to planning, political influence, lack of long-term vision within the energy sector, inadequate financial support in form of loans and grants, and absence of mitigation tools complicate the rural electrification processes. On the other hand, the marketing challenges related to absence of innovative business models, unavailability of energy solutions at rural areas and lack of market resources and knowledge as well as structural and technical challenges that emanate from poor grid conditions, unavailability of pilot projects and insufficient base loads result to inadequate design solutions and higher costs within the energy sector. This is worsened by capacity and informational challenges that emanate from misinformation on available technologies, inability to design, operate and manage effectively as well as limited involvement of local people in project management (Wamukonya, 2013). In the light of these challenges, there is need for paradigm shift within the development of energy in the country and Africa in general. One solution would be to turn to renewable energy. Nonetheless, different strategies are

normally involved in energy access projects; hence, there is need for effective project management to ensure that raw materials and work would be procured in the right way and within schedule.

While this is the case, energy sector is an important one because it plays a vital role in promoting economic growth (Stephen, 2014). The vision 2030, which is a national long-term development strategy, aims to transform the country by improving its competitiveness at global level and standards of living. The vision, which covers the period between 2008 and 2030, provides the national development blueprint with a view of transforming it into a middle-income country and industrialize it by 2030. In line with this, the energy sector has been restructured as outlined in the Energy Act No. 12, 2006 and a sessional paper no. 4 that was developed in 2004(Stern, 2011). Energy use and intensity is one of the factors utilized in a country to measure the level of economic development. Accordingly, vision 2030 identifies energy as key enabler for socioeconomic development. This implies that the development of an energy sector that is reliable, affordable and sustainable is a milestone in the attainment of vision 2030.

At the moment, the government is implementing a solar PV electrification process particularly among the public schools in certain parts of the country. Most of those areas lie in remote areas that do not have access to the national grid. It was expected that by the end of 2019, about 150 public schools would have been installed with about 360 kW of PV electricity (Government of Kenya, 2011). The process of tackling the electrification challenge is a major one; as such, various studies have been conducted in this area of study. Nonetheless, as opposed to evaluating the issue of grid and off-grid electricity connection together, majority of researchers have opted to evaluate them independently. Irrespective of this, the challenge of attaining universal electricity access in the country would require the two types of electricity connection to be evaluated together.

Most of the studies that have conducted in the past have focused their attention on identifying factors affecting rural electrification with most researchers addressing themselves to the roles that governments play in driving rural electrification. In spite of this, very few of these studies

have addressed themselves to funding mechanisms, legislative frameworks and institutional factors that support the implementation of access to energy strategies and policies (Maithani and Gupta, 2015). In energy access projects, various key players in energy sector are set up with each player having a distinct role to ensure they deliver project objectives. These energy stakeholders work within a blend of skills and judgment and their differences manifest while exercising their skills and judgment during project implementation (Zhang and Kumar, 2011) which further leads to huge disparities in time, cost and quality overruns during project implementation. This gap thus calls for rigorous study to ascertain the extent to which rural electrification expansion strategies influence the implementation of energy access projects in underserved counties in Kenya.

1.3 billion people live without access to any electricity worldwide whereas global demand for electricity is rising at nearly two times the total capacity. In September 2011, the UN Secretary General launched the Sustainable Energy for All (SE4All) initiative with the aim of achieving three goals by 2030: ensuring universal access to modern energy services; doubling the global rate of improvement in energy efficiency; and doubling the share of renewable energy in the global mix (IEA, 2014). The UN Secretary-General's initiative on Sustainable Energy for All (SE4All) that was launched in 2011 as a multi-stakeholder approach brings together people from different backgrounds to ensure that sustainable energy is delivered to every person. Ensuring access to energy to the underserved counties in Kenya would thus promote economic development in the country by improving the standards of living, improving health, promoting equity, enhancing income-generating activities, education and promoting sustainability at environment level. Based on this, the current study focused on rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in selected underserved counties in Kenya.

1.1.1 Implementation of Rural Energy Access Projects

Provision of energy that is clean and safe is one of the main objectives of rural energy access projects. Nevertheless, the success of such projects depends largely on management of probable risks. Project stakeholders who include funding institutions, governments, operators and contractors play vital roles in eliminating some of these risks. The process of

operationalizing project control mechanisms attempted to address the implementation challenges of energy access projects (Baharuddin, Chan and Azami, 2010). In addressing these risks and challenges, the current study is likely to quantify the increase in efficiency and effectiveness in managing the rural electrification projects, devising market related solutions and models and further coming up with a watertight maintenance schedules for implemented energy access projects in underserved counties in Kenya

A report by ADB, (2011) that addressed itself to implementation of energy access projects within developing countries, showed that poor electricity supply had the ability to constrain productive activities by enterprises and households. In spite of this, no matter the quality of energy, an electricity supply that is too expensive hinders consumers from connecting to it. Accordingly, the cost of electricity would still be important in electricity supply despite its quality. Furthermore, adequacy and stability are also important in energy supply. If energy is not adequate and stable, energy-suppliers may not be able to supply it and sustain electrification processes. Based on this, it is argued that the link between energy development and access is two-way. On one hand, development cannot be promoted in the absence of reliable access. On the other hand, access initiative that is financially self-sustaining cannot be implemented if energy is not developed successfully to ensure that it would meet the demand for that energy.

The government does not only play the role of regulating energy in terms of issuing licenses, but it also plays the role of promoting energy by providing incentives that reduce the payback period for those projects and capital costs (Baharuddin *et al*., 2010). Accordingly, it should consider providing financial aid to energy access projects that deserve to be promoted to enhance their viability. In addition, it should ensure that the energy environment is conducive to investors so that it can attract them. This would be critical in encouraging manufacturers to produce products that suit local needs thereby minimize capital expenses on those products.

Currently, there are financial professionals who understand the actual capability of energy access and willing to assemble capital resources that can be utilized to sponsor the development of energy access projects. These people in conjunction with other financiers may be able to

join hands to exploit the unique potential of the energy sector. The projects will then engage contractors with good reputation to offer engineering services, commissioning and procurement purposes. Furthermore, they will engage reputable companies to operate the projects, repair and maintain them throughout the concessional period and even throughout the loan period. If that is done, then the end users will pay for energy services; hence, generate the revenue needed to run those projects (ADB, 2011). The revenue generated will be utilized to repay loans and cater for monthly expenses to maintain the projects. Even though profit emanating from whole project is determined by service tariffs, there would be the need to justify the tariffs on the basis of balance point to ensure that consumers would afford them and at the same time generate revenue that would sustain the project.

In a related study Angelou, (2013) on the effective implementation of energy access in developing countries, the study found out that the use of technology could be enhanced by the use of several strategies such as development of latest energy access technology especially those related to information services, renewable technologies, the use of demo projects, capacity building programs that focus on awareness, improved policies, financial frameworks that support those projects, competitive technologies at local level, research and development programs and the use of international standards in solar technology.

In implementation of rural electrification projects, the main stakeholders are the government, private sector, funding institutions, project company and locals who are the end users. These people are important in evaluating the implementation of projects. The quality of projects is one of the key measures of quantifying the rate of project implementation of energy access projects. According to PMI (2013), quality measures the extent to which a project complies with quality standards. It also helps in identifying means that can be used to eliminate the attributes that cause results to deviate from desired outputs. The number of projects completed within time is also a key of success of project implementation. A study conducted by Khosravi and Afshari, (2011) showed that the number of projects performed within the budget is vital as it makes the project viable and cost-effective. The current study thus measured project implementation in terms of number of projects completed within budgets, number of projects completed within time, quality and frequency of maintenance as the key measurable.

1.1.2 Rural Electrification Expansion Strategies

Rural electrification expansion strategies aim to not only make sure that the underserved populations are provided with electricity services, but also make sure that those services match the needs of those people especially those related to development. Nonetheless, the World Bank's ESMAP shows that electricity access cannot be comprehended as a binary issue that involves the connected and unconnected people. Accordingly, it defines a multi-tier framework that includes five access tiers, each of which involves progressively higher demands in form of hours of availability and power delivery. The framework emphasizes the real latent of non-traditional systems that supply energy such as mini-grids and stand-alone solar systems that contribute to development. Odarno and Takahashi, (2016) argued that various stakeholders in the energy sector need to come up with rural electrification expansion strategies that will help in driving economies of the underserved counties and also improve the social and economic status of the population residing in those counties. Access to electricity is regarded as a basic attribute in development thereby efforts are underway among developing countries to ensure that majority of the people have access to electricity both in terms of basic supply and ensuring that consumers are able to move up through energy tiers.

The strategies are intended majorly for service providers, policy makers and electricity planners in developing countries. The actors are thereby working hand-in-hand to close the electricity gaps in the energy sector that is developing rapidly (Odarno, *et al*., 2016). To this end, several strategies in each of the three areas identified were critical for implementing effective electricity access initiatives. The key stakeholders in energy sector should be involved in the change process. An effective electricity delivery that meets development needs demand that we look beyond the centric approaches of the conventional technology and embrace more holistic perspectives in enabling the members of the public to access electricity. When a variety of issues are considered, solutions to electricity access could be developed that respond to developmental priorities. The solutions would be accompanied by strategic measures that would address the quality of supply and affordability issues.

In order for the full benefits of energy access initiatives to be realized, governments have critical roles to play in harmonizing all developmental sectors. Shrestha and Jiwan, (2015)

argued that a response to energy access challenges that is driven by demand is able to facilitate a clear understanding of the definite development priorities that the energy sector would be able to satisfy. This would facilitate the process that would be utilized to develop robust demand for energy services that would be critical in underpinning the sustainability of initiatives made in energy access. The process of exploiting synergies in energy sector and establishing linkages between electricity supply and developmental demands for other sectors require well-coordinated interaction between various stakeholders. In the current study it is against these arguments that the study attempted to evaluate the influence of project planning strategy on the implementation of energy access projects in underserved counties in Kenya. Planners and policy makers with the help of civil societies and private sector may be able to develop solutions that address themselves to issues related to quality of supply and affordability that most of the times impede access to electricity services even in the presence of effective technologies for service delivery.

The rural electrification process can be executed via the on-grid or off-grid method. The on-grid option concerns itself with extending electricity distribution to rural areas via electricity grid. The grid connection is the most preferred one because it facilitates energy supply at lower prices. But rural electricity connections are expensive to construct than urban connections because the customers are scattered over a wide area, access is more difficult and the consumption usually is much lower. This calls for the use of the Off-grid electrification which refers to a power supply system that stands on its own. This system of supply provides electricity to a single person using a single or multiple generator sources that exist in form of hybrid system or in form of a variety of electrical appliances (Shrestha *et al*., 2015).

Electricity may be regarded as the backbone for socio-economic development in any country because it impacts most of the services that directly improve the quality of life (Yadoo, 2012). Nonetheless, this situation has become more complicated in the present world because steady electricity supply is not only important, but it is also important to ensure the energy generated is produced in a green fashion. In line with this, Kenya established the REA under section 66 of Energy Act 2006 (No. 12 of 2006). The authority was mandated by the government with providing green and clean energy to all rural parts of the country. An important aspect to this

mandate is the fact that the country is located along the equator; accordingly, it has immense potential for producing solar energy as one of its source of energy.

The off-grid solution such as solar energy provides an effective way of providing electricity to rural areas in a way that is cost-effective and that can be scaled up easily. Another important aspect is the fact that there are many multiple actors in the country who invest in off-grid energy. These actors produce solar lanterns, renewable energy mini-grids, and solar systems for single homes. Accordingly, there is a possibility that Kenya can become a good place for providing the off-grid solutions that may be exported to other parts of Africa (Yadoo, 2012). Nonetheless, the said sector currently faces two main challenges namely; the lack of link between the off-grid connections provided by private sector and the on-grid one provided by government. Accordingly, there is a likelihood of developing off-grid energy in areas that the government intends to electrify using the on-grid strategy. In addition, there is a likelihood both connections may not be integrated in a cost-effective manner across the country.

The issue of tackling energy access in the country has been a major challenge. Accordingly, researches have been conducted in this area of study over the last few years with some of the studies focusing their attention on off-grid and others on on-grid connection. Zeyringer (2015) claims that universal electricity access in the country by 2030 requires the on-grid connection to be integrated with the off-grid one because the remaining time is short while the number of people who need to be supplied with electricity within that time is high. Devising strategies geared towards driving rural electrification expansion will require all key stakeholders to combined efforts and collaboration among stakeholders who will come up with suitable business models provide market related solutions. This will facilitate a more holistic evaluation of probable electrification pathways and strategies for the country to reach SDG7 by 2030. The rural electrification expansion strategies that were considered in the current study are project planning strategy, project service outsourcing strategy, project fund mobilization strategy and project company strategy and the extent to which these strategies influence the implementation of energy access projects in underserved counties in Kenya

1.1.3 Project Control Mechanisms

These mechanisms are vital in the success of any projects. They ensure that projects meet intended goals while they adhere to laid out budget and time limits. Lovins, (2010) in his study argued that the main components of project controls mechanisms included prioritization, management of external resources involved in a project, the process of tracking milestones, the process of handling contingencies that occur at the time of executing projects, the process of tracking cost and time among other issues that influence the way projects are implemented.

In a project, it is very easy to lose sight of the actual objectives. Large projects acquire a life of their own and, if left to themselves, can spin out of control. There must be mechanisms to control the project and to ensure that the project is proceeding as planned. Mostly, the control of a project focuses on the following three elements of the project; performance, cost and time. The objective of having controls is to find out where there is a problem and then to alter course by taking corrective measures. Project control is not simply waiting for things to go wrong and then fixing it. It is chiefly to have systems to identify problems before they manifest themselves (Lovins, 2010). To deliver a sustainable infrastructure project, the project also should be actively managed towards its goals during the implementation phase and this management is covered in project control mechanisms. According to Cardinal and Long, (2010), achieving project goals during project execution has typically been built upon the definition of clear performance measures and verified using various diagnostic project control tools, such as earned value analysis and project health checks. In the holistic view, control can take many forms, and it is typically divided into control modes (formal and informal control) and control mechanisms (rules, plans, budgets, schedules, and social control).

The three control mechanisms include the post-performance, go/no-go and cybernetic mechanisms. The cybernetic ones are the most common ones and they relate to outputs in a project. Almost every project involves outputs and inputs. The outputs, in this case, might relate to the milestone met in a project. Accordingly, whenever outputs or milestones are not met in a project, they should always be evaluated to determine what went wrong during the execution process of a project. This type of control mechanism focuses its attention to reducing deviations from pre-determined standards. As a result, the more a project deviates from

attaining its milestones, the more attention should be given to that project (Nayab and Jean, 2011).

The go/no-go control mechanisms test the pre-conditions of a project before tasks are undertaken to determine whether they should be undertaken or not. This type of control measure may be used for specific part of a project as well. The control measures are linked directly to actual plans implying that they are not independent of them. This is in contrast to post-performance mechanisms that are applied once a project is completed. The post-performance mechanisms do not alter steps taken in any project, but it ensures that good and bad practices are identified in a project so that they can help in the future.

The project control measures may be regarded as the processes involved in gathering data, managing and analyzing progress to predict, comprehend, and influence in a constructive manner the cost and time outcomes of a program or project by way of communicating information in formats that help management to be conducted effectively and decisions to be made in the right way. Normally, projects are conducted in environments that are relatively unstable. As such, sometimes it might be inevitable to change baseline schedules. In this respect, progresses made in projects need to be controlled and monitored at discrete points in time (PMI, 2013).

Projects may succeed and fail in terms of how they reach their goals and how they are managed. The achievement of project goals requires efficient project control mechanism. In the light of this, it would be important to note that projects need to be controlled in the right way to achieve their goals. Project controls may be regarded as all-inclusive because they include the process of planning, executing and completing projects; hence, they assist all the lifecycles of projects. Nonetheless, the use of these control mechanisms vary from one person and project to the other, but they address themselves to and even control the following facets of project management system; they define the methods that enhance the prospects for project management use, help in estimating projects' costs, help in developing project strategy, help in controlling costs, help in assessing projects' value and play important roles in developing projects' schedules. In addition, they control project documentation process, help in diagnosing

projects' schedule, help in over sighting and assessing the quality of materials supplied, help in integration of control measures and breaking projects down into small segments that are manageable among other things that relate to project management (Silvius and Schipper, 2014).

In the current study, project control mechanisms were measured based on planning & standardization, engineering design, business models and operation and maintenance of the solutions. These were quantified in terms of the level of coordination of project control mechanisms, accuracy in the engineering design and simplicity in the operation and maintenance of the project control mechanisms. Toor and Ogunlana (2006), in their study suggested that project control mechanisms should be simple, uncomplicated and timely to measure whereas Litsikakis (2009) suggested that project control mechanisms should be able to capture quantifiable benefits with a project. In line with these arguments, the current study evaluated the moderating influence of the project control mechanisms on the relationships between rural electrification expansion strategies and the implementation of energy access projects in the country.

1.1.4 Energy Sources in Kenya

Even though Kenya has limitless energy sources including sun powered, bio-fuel, hydropower, geothermal, and biogas among others, their utilization has been limited in a way. Nonetheless, the use of renewable energy is currently driven by the rising price and demand for electricity, environmental pressures, and the ever rising cost of oil and gas in the global market. Currently, the hydropower makes more than 70 percent of the aggregate energy in the country. Accordingly, the national energy may in part be described in terms of hydropower. In addition, it may be described in terms of frequent power outages, over reliance on imported oil and the low access to cutting edge energy. As a result, it would be necessary for the country to adopt renewable sources of energy to address some of the challenges related to non-renewable energy as well as meet the ever rising demand for energy and act in an environmentally friendly manner (Kiplagat and Wang, 2014).

The renewable energy systems may play critical roles in meeting the demand for energy in the remote parts of the country that may be uneconomical to distribute the hydro-powered energy, which is not able to meet the national demand for energy. This is in relation to the fact that only 6 percent of the people living in those areas have access to on-grid electricity. There are many types of renewable energy currently in use, they include; Solar energy, Wind energy, Wind energy, Biogas energy, Geothermal energy and Hydroelectric power**.** Solar energy utilizes direct sun-based irradiance to make power utilizing photovoltaics' cells and concentrating sun powered energy to make warm energy to meet direct lighting prerequisites and additionally to create energy that may be utilized in transport industry and in other areas of life. At the moment, there is high solar energy potential in the country because the country receives about 4 to 6 kWh/$m^2$of solar energy every day. Solar energy use in the country is largely on warming water and for photovoltaic frameworks. The Solar photovoltaic frameworks are utilized chiefly as a part of media transmission, water pumping and lighting. In this respect, the country has installed about four megawatts of solar energy for this purpose. Additionally, there are about 140,000 sun-oriented water warming frameworks in the country (Kiplagat *et al*., 2014).

Wind Energy utilizes the active energy of moving air. Power is created from expansive wind turbines found either in coastal or seaward environments. Since Kenya lies along the equator, there are no strong torrent winds in the country like those experienced in other parts of the world that lie outside of the equator. In spite of this, a variety of studies have demonstrated that the topographical nature of the national landscape plays major roles in modifying the nature of winds experienced in the country. Accordingly, despite the fact that the country does not lie within the geographical area that may be regarded as good for wind power, the country enjoys a substantial amount of wind that may be utilized to generate wind power. In this respect, the ministry for energy has been able to identify various parts in the country such as Ngong, Coastal regions, Turkana and Marsabit that may be good for wind power. In contrast to other parts of the country, these regions enjoy a wind speed of between 8 and 14 m/s that may be good for commercial purposes (Harris, 2014).

Biogas energy can be derived from diverse biogas feedstock, including woodland, rural and animal's deposits; the natural constituent of civil strong waste among other natural waste sources. Although with different processes, these feed stocks can be used directly to give out power or warm, or can be used to make vaporous fluid, or strong fills. Kenya biogas density is moderate but there is a lot of potential to deliver biogas energy. As a way of ensuring that the members of the public are knowledgeable about the importance of biogas in the country with a view to reducing their over reliance on wood, the ministry for energy has made effort to market biogas technology within the country by organizing seminars and workshops. This has been going on since the early 1980s. Similarly, various Christian-based organizations and NGOs have actively engaged themselves in this exercise to help the members of the public embrace the biogas technology. Nonetheless, despite the huge potential for biogas in the country, its uptake among the members of the public has remained to be relatively low. The uptake of this technology in the country has largely been hampered by inadequate information relating to its benefits among the members of the public, the relatively high cost of installing the biogas system, and lack of piped water in most of homes in rural areas. Other challenges relate to poor maintenance of the system once installed, the poor designs that result to gas related challenges, the weak technical support from the relevant people and the high costs of maintaining systems (Belward and Bisselink, 2011).

Despite the challenges, Kenya has huge potential for geothermal resources, which are largely located along the volcanic centers found within the rift valley. Presently, the unexploited potential of this resource is estimated to be between 4000and7000 MW. This is in spite of the fact that some areas in the country have been explored fully whereas others are still under exploration. Some of the areas that have been explored so far by KenGen in conjunction with the ministry for energy include Paka, Chepchu, Korosi, the area around Lake Baringo, Bogoria, Arus, Menengai, Eburru, Longonot and Suswa. The preliminary results show that Longonot has a potential of 200 MW whereas Suswa has a potential of 200 MW as well and Menengai has a potential of about 720 MW. The six exploratory wells that have been dug so far in Eburru show that the region can generate about 2.5 MW of the power. The other areas that are yet to be explored fully, but have been identified as potential include the area around Lake Magadi, Badland Volcanic field, Namarunu volcanic field, Barrier volcanoes, and Emurauangogolak.

To date, the geothermal power has been identified as the source of energy that costs less to explore and produce in the country. As a result, the government has devoted itself to facilitating its production and exploitation. Accordingly, it has established the Geothermal Development Company Ltd. (GDC) as a state-owned company to facilitate the process of exploiting this source of energy. The GDC helps in exploring, assessing and drilling geothermal resources to make sure that sustainable levels have been attained as a way of encouraging private investment into the resource (Simiyu and Keller, 2000).

The country has huge resources of hydropower that range between 3000 and 6000 MW. Nonetheless, it is estimated that the country has not exploited about 1509 MW of its hydropower potential. About 1310 MW of this potential can support mega projects that consume approximately 30 MW of power and even more than this. The potential lies within five geographical regions in the country that are considered the national drainage basins. It is estimated that if the five regions would be exploited, then they would be able to generate about 5935 GWh per annum. In spite of this, about 709 MW from large projects and 31 MW from small projects have been exploited and it contributes about 70 percent of energy in the country. Most of this power is owned by KENGEN as well as tea processing companies. As a way of encouraging small companies to produce more energy, the national government has developed a feed-in-tariff policy that feeds the energy the small companies produce into the national grid (Kiplagat *et al.*, 2014).

In relation to solar energy, the country is able to generate between 4 and 6 kWh/m^2/day. On average, this gives about5 kWh/m^2/day, which is comparable to 250 million tons of oil every day. In spite of this, the country has a high insulation rate because on average each day receives about 5 hours of sunshine. In the mountainous regions, this is about 700 kWh and 2650 kWh in arid and semi-arid regions whereas the larger part of the country experience between 1750and1900 kWh range. Regardless of this, a substantial amount of this energy is harnessed for use. In spite of this, the solar energy may be utilized in solar photovoltaic (PV) to help in pumping water, drying crops, telecommunication, refrigeration and lighting. To address this challenge, the government has resulted to implementing a solar PV electrification process particularly among public schools in certain parts of the country. Most of those areas lie in

remote areas that do not have access to the national grid. It was expected that by the end of 2019, about 150 public schools would have been installed with about 360 kW of PV electricity. This would be critical to those schools and in education sector in general. It would also be important to remote areas in the country because the solar energy would be used in refrigeration for cooling purpose (Government of Kenya, 2011).

1.1.5 Energy Sector in Kenya

The key industry players are MOEP, ERC, KenGen, Independent Power Producers (IPPs) and Kenya Power Company (KPC). The MOEP is accountable for developing and designing energy approaches to make an empowering situation for proficient operation and development of the part, readiness of the slightest cost advancement program for the power division; directing execution of the provincial charge program and encouraging the assembly of assets for the segment speculation. The ERC (now EPRA – Energy and Petroleum Regulatory Authority) oversees control of the power sub-division. Built up in 1998 under the Electric Power Act of 1997, the ERC (now EPRA) has the order to set, audit and change retail taxes, advance rivalry in the sub-segment, resolve purchaser protestations and uphold ecological, wellbeing, security directions (Government of Kenya, 2011).

KenGen which is the main electric power maker in Kenya representing more than 80% of electric power expended in the Country, enabling it to have the biggest market share. The IPPs account for 20% of electric power expended in the Country. The competition level in the industry has been on the increase. In 1996, the national government authoritatively changed power era as a component of the power part change endeavors. The main IPP advancements happened on the heels of the 1996 enactment opening the era area to private sector participation. There was an expansion in power request, hydrological conditions were getting to be unfavorable and open assets to fabricate control plants were lacking (Government of Kenya, 2011).

1.2 Statement of the Problem

290 million out of 915 million people living in Sub-Saharan Africa have access to electricity and the overall number of people without access to electricity is increasing. Nearly 80 per cent of those without electricity access across sub-Saharan Africa are in rural areas, a significant distinction when evaluating suitable policies and technological solutions for energy access strategies (IEA, 2014). Kenya like every other developing nation is no different when it comes to coping with an energy crisis. In 2015, Kenya had only 46 per cent of the population with access to electricity, meaning that most households relied on traditional energy sources such as firewood, charcoal, kerosene. The total number of households without electricity in the 14 underserved counties in Kenya is 1.2 million (Republic of Kenya, 2013). These underserved counties are West Pokot, Turkana, Marsabit, Samburu, Isiolo, Mandera, Wajir, Garissa, Tana River, Lamu, Kilifi, Kwale, Taita Taveta and Narok. Beside accounting for 72 per cent of the country's total land area and 20 percent of the country's population, access to energy in these counties is still very low compared to other counties in Kenya. Failures of completion of energy access projects within time, quality and budget in underserved counties has resulted in these areas remaining economically underdeveloped. The implementation of rural electricity programs has been a challenge to the government with only 36% of the rural population having access to electricity.

The Government of Kenya through the Kenya Rural Electrification Programme has played crucial role in the provision of electricity to rural areas in bid to spur human, social and economic development in the country. The energy sector has been restructured as per the Sessional Paper No.4 of 2004 and the Energy Act No.12 of 2006 (Stern, 2011). It is a requirement of this session paper that the Rural Electrification Authority (REA) develops a strategy to enhance rural electrification in the country. Kenya has a long-term development strategy, The Vision 2030, whose aim is to drive the country into a globally competitive and prosperous economy with high quality of life. Covering the period 2008 to 2030, the country's new development blueprint aims to transform Kenya into a newly industrializing, middle-income country providing a high quality life to all its citizens by the year 2030. The level and the intensity of energy use in a country is a key indicator of economic growth and development. The Kenya Vision 2030 described energy as one of its social economic pillar's enablers for

infrastructure. Access to energy is a crucial element in realization of sustainable, affordable and reliable energy for all citizens.

The underserved counties of Kenya present profound infrastructure deficits, including lack of access to roads, electricity, water, and social services. Many cultures in marginalized areas were historically nomadic, based on pastoralist lifestyles, and with low population densities. There is also significant insecurity in certain areas, giving rise to substantial numbers of displaced persons and livelihood adaptations that further undermine economic development in some of those regions (Republic of Kenya, 2013). Due to the specific challenges posed by low population density, low energy demand and undeveloped rural economies, there is need for strategies that require special financing conditions, design and construction standards specifically formulated to address rural power-supply characteristics, and a project control mechanism that involves coordination and sequencing of the relevant projects so that losses arising from gaps between strategies and implementation are mitigated.

Governments have a role to play in harmonizing the efforts of all development sectors to realize the full benefits of energy access initiatives. Shrestha and Jiwan, (2015) argued that a demand driven response to the energy access challenge also facilitates a clearer understanding of the actual development priorities that energy services can or should satisfy. This, in turn, creates opportunities for building the robust demand for energy services that will underpin the long-term sustainability of energy access initiatives. Establishing linkages and exploiting synergies between electricity supply and other sectors of development demands well-coordinated interaction between stakeholders in these different sectors. Together with the private sector and civil society, policymakers and planners can also devise effective solutions to address the affordability and quality of supply issues that too often impede access to electricity services and the satisfaction of salient development needs, even when the appropriate technologies are readily available.

After reviewing a number of studies done in Kenya, Kiplagat and Wang, (2014) revealed that most studies focussed on specific energy source projects or specific counties not categorized under underserved and therefore makes it difficult to generalize to energy access projects in the underserved counties and this study attempts to fill the gap and contribute to the available

literature and build the research data base to future scholars and researchers as it will act as a source of reference besides suggesting areas for further research. It is against these arguments that the current study sought to examine the rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved counties in Kenya.

1.3 Purpose of the Study

The purpose of this study was to examine the influence of rural electrification expansion strategies on implementation of energy access projects among rural households in underserved counties in Kenya. Further, this study sought to determine the moderating influence of project control mechanisms on the relationship between rural electrification expansion strategies and implementation of energy access projects among rural households in underserved counties in Kenya.

1.4 Objectives of the Study

The study was directed by the following specific objectives:

i) To examine the extent to which project planning influence implementation of rural energy access projects in underserved counties in Kenya,
ii) To establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya,
iii) To determine the extent to which project fund mobilization influence the implementation of rural energy access projects in underserved counties in Kenya,
iv) To examine the extent to which project company influence the implementation of rural energy access projects in underserved counties in Kenya,
v) To establish the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya,
vi) To establish the extent to which project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya,
vii) To establish the extent to which project control mechanisms moderates the relationship between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in Kenya.

1.5 Research Questions

The following were the research questions:

i) To what extent does project planning influence the implementation of rural energy access projects in underserved counties in Kenya?

ii) To what extent does project service outsourcing influence the implementation of rural energy access projects in underserved counties in Kenya?

iii) How does Project fund mobilization influence the implementation of rural energy access projects in underserved counties in Kenya?

iv) To what extent does project company influence effectiveness of rural electrification projects implementation in underserved counties in Kenya?

v) How does combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya?

vi) How does project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya?

vii) What is the moderating influence of project control mechanisms on the relationship between rural electrification expansion strategies and the implementation of rural energy access projects in underserved counties in Kenya?

1.6 Hypotheses of the Study

The study's hypotheses were:

1.H_0: Project planning does not influence the implementation of rural energy access projects in underserved counties in Kenya.

1.H_1: Project planning significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

2.H_0: Project service outsourcing does not influence the implementation of rural energy access projects in underserved counties in Kenya

2.H_1: Project service outsourcing significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

3.H_0: Project fund mobilization does not influence the implementation of rural energy access projects in underserved counties in Kenya.

3.H_1: Project fund mobilization significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

4.H_0: Project company does not influence the implementation of rural energy access projects in underserved counties in Kenya.

4.H_1: Project company significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

5.H_0: Combined rural electrification expansion does not influence the implementation of rural energy access projects in underserved counties in Kenya.

5.H_1: Combined rural electrification expansion significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

6.H_0: Project control mechanisms do not influence the implementation of rural energy access projects in underserved counties in Kenya.

6.H_1: Project control mechanisms influences the implementation of rural energy access projects in underserved counties in Kenya.

7.H_0: The strength of relationship between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in the country does not depend on project control mechanisms.

7.H_1: The strength of relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya depends on project control mechanisms.

1.7 Significance of the Study

The study focused on rural electrification expansion strategies and the extent to which they influence the implementation of energy access projects with a view to establishing the best practices and strategies that would work for the energy sector. The study also provided further information on the extent to which project control mechanisms moderated the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya. These study findings will be of great importance to the county governments, governmental organizations and project management teams, to establish the determinants of a performing energy access project, contributing to higher rate of project success; this is important as it elaborates on the key strategies to consider during the

implementation of energy access projects. The research conclusion and recommendations will improve management knowledge and skills of energy implementation professionals, given that energy connectivity plays an important role in the growth of the country's economic and social sector, and the government allocates large amounts of money annually to rural electrification in the electricity sector. Consequently, the findings may be of great relevance to all energy stakeholders in improving efficiency and effectiveness through best practice.

The cost of connecting an individual household to the national electricity grid system in the country is about Kshs. 35,000 (Eur. 318.18). This fee is relatively high to majority of the people living in rural areas. Accordingly, it hinders majority of the people connecting to electricity especially among the small-scale businesses and low-income households. Therefore, the study's findings would help all stakeholders to identify suitable business models that would be beneficial to decentralized alternative sources of energy, such as solar. In addition, they would enable various stakeholders in energy sector to comprehend the benefits that come with successful implementation of rural electrification strategies and projects together with challenges that face the implementation of energy access projects.

1.8 Limitations of the Study

The study faced some limitations. Since the geographical locations are vast and households widely spread out, there was a challenge of traversing those geographical areas within the available research time. Data was collected from rural households and commercial centers located in the vast region of underserved counties in Kenya which required a lot of time and financial resources to be accomplished. The engagement of trained research assistants was of much help for it was possible to cover all targeted counties within a shorter period of time at lower cost and further the study area was divided into six service centers for ease of traversing the study area to collect the data. The sample was small to the extent that it challenged the process of generalizing the study's findings to target population and other counties in the country. Nonetheless, stratified sampling method was utilized to address some of these challenges. In addition, the questionnaire was designed in a way that it included various research questions to collect data exhaustively.

Further limitations to the study were cases of unwillingness of some respondents to take part in the study and furnish the required information. To mitigate this, the researcher with the assistance of research assistants distributed the questionnaire while trying to create a rapport with the respondents while at the same time assuring them of their anonymity. Another limitation that was faced was the issue of confidentiality as some respondents were reluctant to give information. To mitigate this, the researcher informed the respondents that the data they provided was utilized purely for academic purpose; as such, it would not be shared with anyone.

1.9 Delimitations of the Study

The study restricted itself to examining the influence of rural electrification expansion strategies on the implementation of Energy access projects in the country. Its predictor variables included project planning strategy, project service outsourcing strategy, project fund mobilization strategy and project company strategy. The influence of these variables on the implementation of rural energy access projects moderated by project control mechanisms was also evaluated. Mixed methods were utilized to conduct the study whereas cluster and purposive sampling methods were utilized to pick the research participants. The data was then collected through observation guide, interview guides and questionnaires.

1.10 Assumptions of the Study

The study envisaged to examine the influence of rural electrification expansion strategies on the implementation of energy access projects in underserved counties in Kenya. Therefore, the researcher assumed that project planning strategy, project service outsourcing strategy, project fund mobilization strategy and project company strategy influences implementation of energy access projects. Further the researcher presumed that the respondents would be willing to provide information in an honest manner. In addition, the researcher presumed that the factors excluded from the study would not influence the study's findings. Furthermore, the researcher presumed respondents would be accessed and that they would provide accurate information.

1.11 Definition of Significant Terms used in the Study

Energy Access: Refers to the ability of the members of the public in target areas to access affordable and reliable electricity supply, which enables them to carry out their daily activities whether domestic or business related in an effective manner. The presumption was that electricity supply would increase with time to cover larger parts of the target regions.

Implementation of Energy Access Projects: Refers to the process of executing energy access project within targeted areas in an effective manner so that it would be able to monitor the progress of those projects and their impacts on people living in those areas. This was intended to ensure projects were completed within stipulated time, budget and were of high quality. Implementation of energy access projects was measured in terms of number of schools, commercial and household connections, number of projects completed within budget, frequency of maintenance, number of projects completed within time and quality of completed projects.

Project Company: In this study project company performs execution and implementation of energy access projects and ensures that the rural electrification expansion strategies, plans and deliverables are executed accordingly. This study defined project company in terms of single point of responsibility, contract price and innovation and service level agreements/warranty.

Project Control Mechanism: These are the measures put in place in a project to ensure that it is able to achieve its intended goals while it adhere to laid out standards and procedures. It also ensures that projects are completed within allocated budgets and within the right time. Some of its major elements include ability to handle contingencies as they occur during the project cycle, ability to track milestones, and ensuring that the study remains focused

on its intended purposes. Project control mechanisms was defined in terms of planning and standardization, engineering design and operation and maintenance.

Project Fund Mobilization: Is a financial strategy commonly used by organizations to raise capital to cover project costs before work begins on a project or prior to invoicing. This study defined project fund mobilization in terms attracting private investment, leverage funding and attracting impact investors.

Project Planning: Is a process that details the process to be followed in conducting the study to ensure that it is completed within stipulated time. In the current study, it relates to efforts by the government to promote general economic fairness through regulation, policy formulation and even subsidies in the energy access sector. Accordingly, project planning was measured in terms of policy formulation, building capacity and integrating energy access with development programs.

Project Service Outsourcing: This is a process that allows project owners or contractors to contract the services of another company in executing a project. It allows those people and institutions to benefit from external expertise, manage risks effectively and manage costs so that they can focus their attention on other issues of importance to them. Project service outsourcing is most beneficial when the engagement demonstrates a clear added value for all parties, improves energy access, promotes transparency and avoids conflicts of interest. This study defined project service outsourcing in terms of scope of project activities, technology customization and innovation and development of business models.

Rural Electrification: A process of ensuring that people in rural areas have access to electricity or simply they are connected to grid electricity. The

electricity in this case does not only provide light to households in rural areas, but it also enables the people living in those households to engage in business activities and even mechanize most of their farming activities including the milking processes, threshing and grain hoisting. This helps them to improve their ways of life, hence, contribute to economic development.

Rural Electrification

Expansion Strategies: This refers to a combination of formalized action plans intended to enhance expansion of rural electrification. Rural electrification expansion strategies were defined in terms of project planning, project service outsourcing, project fund mobilization and project company with a view to transforming processes and final results of energy access projects.

Undeserved Counties: Are marginalized counties in the country most of which the people living in them have been sidelined from national development for a long time. It also includes the geographical locations where significant populations of those communities live. The study was conducted in 14 counties termed as undeserved counties by the CRA. These underserved counties are West Pokot, Turkana, Marsabit, Samburu, Isiolo, Mandera, Wajir, Garissa, Tana River, Lamu, Kilifi, Kwale, Taita Taveta and Narok. The 14 underserved counties included in the study consist about 20 percent of national population and they cover about 72 percent of national land mass. Majority of the people living in these areas are nomads and they rely on pastoralist activities. Accordingly, there is poor road network, does not have piped water and even electricity among other social services.

1.12 Organization of the Study

This thesis has five chapters. Each chapter entails diverse research components which are synchronized to ensure full communication to the audience of the subject of the study, the methodology used, the findings, conclusions and further areas of study. The first chapter introduces the study by providing background information, outlining the study's limits, scope, purpose, objectives, hypotheses, significance and limitations. It also defines significant terms used in the study. The second chapter contains the review of literature on dependent and independent variables and the combined influence of the independent variables on the dependent variable as well as the moderating influence project control mechanisms on implementation of energy access projects.

Theoretical and conceptual frameworks are also examined. The third chapter consists of research methodology in form of research paradigm, design, target population, sampling procedure and sample size, data collection procedures, research instrument as well as techniques utilized to analyze the data. It also provides the ethical considerations and even the process utilized to operationalized the variables. The fourth chapter consists of the findings. In this chapter, the study findings which have been analyzed and discussed based on the themes drawn from the study objectives. The chapter highlights the thematic aspects of the study, namely: the questionnaire return rate, demographic characteristics, descriptive statistics, correlation and regression analysis on the variables under study. Lastly, the fifth chapter concludes the study by summarizing the findings and suggesting the way forward besides recommending what needs to provide all people with electricity.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This part of the study provides the secondary data obtained from books, circulars, journals, documents and publications from government that relate to energy access projects. It examines the way various studies have evaluated the rural electrification concept, its influence on households, the challenges and benefits that firms encounter together with the factors that bar effective implementation of rural electrification projects. It concludes by providing the conceptual and theoretical frameworks before identifying existing knowledge gap.

2.2 Implementation of Energy Access Projects

Implementation outcomes of energy access project are based on evaluation of multiple stakeholders who include clients, private sector, project funding institutions and project company that participate in the implementation in terms of projects that finish within budget, time, cost, number of schools, commercial and household's connections and frequency of maintenance. Few authors have evaluated the way project implementation needs to be measured. This gap therefore suggests that studies about how to quantify success of project implementations is still not conclusive (Clark, 2009). This is in relation to the fact that almost every stakeholder would quantify success of project implementation from their own perspectives.

Some researchers argue that when projects complete within time, scope and cost while they maintain quality throughout project's life cycle, then they provide some measures for determining the success of project implementation. This argument concurs with the one provided by Sambodo, (2015) who asserts that the successful implementation of energy access projects lay not only on long-term maintenance and good technology performance, but also on six factors namely; community participation, technology maintenance scheme, workshops, the technical skills of those in management team, active communication and efficient project planning. This suggests that the success of project implementation depends on the extent to which different groups of stakeholders are involved in project management and in the sector project implementation is being carried. Lack of conclusion on how to quantify project

implementation greatly informs the reasons for this study so as to examine project implementation from the perspective of rural electrification expansion strategy because they determine the frameworks in which projects are implemented.

An effective understanding of the factors that affect the implementation of the existing energy technologies helps in implementing other projects and initiatives. The initiatives in this case are normally executed by a variety of stakeholders who include government, NGOs, donors, international agencies, universities and private companies (Hermawati and Rosaira, 2010). This study addressed several issues that affected the establishment of energy access projects in rural areas with a view to provide solution to those issues. The authors argued that most of projects executed in rural areas lasted for less than a year and that most of the problems encountered among those projects were not related directly to technology, but to lack of skills to maintain existing technologies, poor management skills and lack of awareness among local people towards projects.

Rural areas mostly the marginalized ones do not have electricity for domestic use in lighting and cooking. A report by the World Bank (2017a) noted that about 40% (about 24.5 million) of households in Indonesia were located in rural areas. Nonetheless, most of these households relied heavily on biomass and conventional cook-stoves that depended on firewood. A similar report by ADB, (2011) documents that by the end of 2015; about 12,659 villages in Indonesia (out of 74,715) lacked electricity. Although Indonesia's national electrification ratio has increased from 43% in 1995 to 84.1% in January 2015, regional disparities exist.

Many of the villages in these areas have potential renewable energy resources, such as biomass, water, wind, and solar. However, private investment in energy infrastructure development for villages in remote areas and small islands is very rare. In many countries, studies show that many consider energy for rural communities not an economically viable business. Like many other countries, challenges in having renewable energy project in these areas are related to geographical conditions, human resources capacity, funding and many more (Schmidt and Wakeling, 2013). Therefore, to overcome these challenges, Tharakan, (2015) suggested that the central and local governments should provide more support for developing access to energy

and its infrastructures. The lesson learned from several villages in remote areas, such as in the provinces of East Jawa and West Nusa Tenggara where the state-owned electricity company does not exist, is that the provision of self-managed energy access brings improvements to the economy of households and that of the community. Since renewable energy produces clean energy, their utilization can also be one climate change mitigation strategy in rural areas.

Brazil has many huge rivers, which contribute over 75% of the national electric energy framework. Approximately 100,000 MW of this energy is produced by hydro power plants. This attribute places the country at an advantageous position over others in terms of energy production (Castro and Timponi, 2011). Castro *et al*., (2011) claim that the construction of hydropower plants in Brazil started in 1970s and that it was largely supported by the military government. Back then electricity was a vital element for national development. Nevertheless, even if Brazil as a country has huge potential for producing hydropower, the generation of this power remains restricted. The one factor that has hindered the development of many hydropower plants in Brazil is the fact that such plants are long-term; as such before they are implemented they need to be evaluated deeper to ensure that they will not stall once started (Divakar and Subramanian, 2009). As a result of this, there are no ongoing hydropower related projects in the country, which affects the amount of electricity that can be distributed to business enterprises in the country.

The quality of completed projects is also a key measure of success of implemented projects in rural areas. It concerns itself with the extent to which projects comply with set standards either by stakeholders or relevant bodies. This helps in eliminating some of the challenges that emanate from unsatisfactory results and devising ways to eliminate them (PMI, 2013). The contribution of project quality in the implementation of energy projects has been evaluated by various researchers like Ogano and Pretorius (2010). As a measure of project success, quality goes hand in hand with costs of a project. Cost is ranked by Khosravi and Afshari, (2011) as the third most important factor in evaluating project success in their study that evaluated the success of power plants as well as in cogeneration projects. Chan and Chan (2004) equally identify quality as an important aspect in the success of project implementation. They claim that it serves as a guarantee that project is likely to serve its intended purpose. The current

study thus attempted to measure success of project implementation of energy access projects through checking the rate at which maintenance of completed tasks are recorded and attended to and also rate of return of energy equipment used in the projects to the warranty centers.

Quality challenges have been encountered by various researchers. A study by Kim and Hwang, (2012) acknowledges the fact that sometimes projects may meet targets set by quality control managers, but if they do not meet contractors' requirements, they might have to be redone. This may result to time delay and cost overruns. Paquin *et al*., (2000) agrees that quality methods may be important in detecting the manner in which project activities vary from desired outcomes so that corrective measures can be taken at an early stage. Whereas Stephen, (2014) argues that so long as project outcomes meet expected outcomes then projects can be termed as successful, Kim *et al.*, (2012) add that such projects need to be profitable for them to be termed as successful. The authors also argue that completion of project within budget limits may not be sufficient to define a successful project because projects need to meet acceptable qualities. From this understanding, it can therefore be concluded that quality is an important aspect in determining the success of a project, which in this study is implementation of energy access projects in underserved counties in Kenya. This in most cases entails conducting quality checks before and after completion of activities and taking corrective actions by either modifying or reworking on project when quality does not meet standards which are normally provided in project contract document.

Studies by Schneider and Hoffmann, (2010) indicate that the successful implementation of energy projects in rural areas has improved the quality of life among people living in those areas. They claim that it has enabled them to access clean energy that is affordable, stimulated economic growth, improved learning processes in schools, improved health in most of rural areas, improved security through lighting, increased the levels of innovation among local people, created business opportunities and allowed people to connect to the national energy grid among other things. In addition, it has increased the level of innovation in rural areas, increased the level of awareness on issues related to sustainable development and healthy environments.

Regardless of these benefits, understanding the factors that influence the implementation of energy access projects in the Indonesian rural areas is a concern for all stakeholders who include local governments together with agencies that develop technologies to help rural communities in the country connect to the national grid (Hermawati and Rosaira, 2017). Accordingly, for energy access implementation projects to be effective, stakeholders in the energy sector including local governments need to understand the influential factors. This could help in ensuring that rural electrification processes would be implemented effectively in Indonesia and even meet the needs of people living in rural areas.

While some of the people continue to base their definitions of project success on various aspects such as public acceptance, economic spin-off and patronage, a lot of literatures in this field of study base their definition of successful projects especially the large-scale ones on cost and time aspects (Ikejemba and Hillegersberg, 2017). A study by Omisore, (2011) however differs from this definition because it bases its definition on project outcomes. This might be a valid argument because if a project does not meet its desired outcomes, it will obviously be hard to maintain it or even continue with it because the members of the public would develop a negative attitude towards technologies with such a project. A good example of the way project fails may be identified from a project that was executed in Lagos, Nigeria. The said project was in the energy sector and it failed simply because of poor planning and failure to follow up the project to ensure that it was within the set standards. Thus, it would be important to ensure that projects have clear definition of the people who own them and entities tasked with the responsibility of maintaining them.

Another factor that causes energy projects in Sub-Saharan Africa to fail once implemented is poor maintenance once those projects are completed. This problem may be attributed largely to overall planning that obviously influences the implementation process. To address this challenge, there should be a form of correlation between stakeholders implementing project and physical maintenance of a project once it is completed. However, a look at the literature review indicates that majority of such projects lack maintenance plans. Accordingly, no one is charged with the responsibility of maintaining projects once they are completed (Hui and Sanchez, 2012). Maintaining such projects should entail inspecting projects to ensure that they

are running as intended and that anything that needs to be done to improve their quality is done on time. It also entails cleaning the parts that need to be cleaned and monitoring performance to ensure that they perform optimally. In spite of this, the literature review indicates that majority of projects installed in the past did not have monitoring systems. This includes the projects that have been implemented in the recent past; thus, even the new ones might be doomed to fail after implementation (Chaurey and Kandpal, 2010). A very critical aspect for basing this study is having service level agreements and warranties so as to determine frequency of maintenance of implemented projects. This study therefore attempted to measure success of implementation of energy access projects by basing its focus on cost methods, schedule, and number of household's connection, quality and frequency of maintenance.

2.3 Project Planning and Implementation of Energy Access Projects

Project planning variables such as policy formulation, building capacity and integrating energy access with development programs are key variables that can accelerate energy access. Policy formulation helps in expanding markets that attract private partners. Accordingly, policies need to be flexible so that they can accommodate various actors. Besides, they need to be clear and consistent so that they can attract private actors and also eliminate barriers that hinder the development of efficient business models. Proper project planning strategies can create incentives and streamline regulations to the extent of creating new markets for energy sector, attracting funds from private firms and encouraging such firms to engage in the sector. This would go a long way in complementing the scarce resources that government might have to invest in the sector thereby allow many people to be connected to electricity (Singer, 2014).

According to IEA, (2011), access to energy is an important aspect in human life because it contributes significantly in improvement of social development and economic growth. Studies indicate that it has direct impact on health sector because some of the machines used in hospitals rely on energy to work. With regard to education, it provides light to students so that they can study for long hours. Besides, it connects them with the wider society when computer-based devices are installed in schools. With regard to employment, it allows people to create new sources of income that can only be created in the presence of energy. Studies indicated that majority of developed economies are developed because almost everyone in them has

access to electricity. This gives an impression that majority of the poor people in developing countries/economies are poor because they do not have access to electricity. No wonder by 2011 majority of the people (95%) who did not have access to electricity in the world came from Africa or Asia especially the south eastern part and that 84% of them lived in rural areas.

The focus of the government to improve and install infrastructure in some areas that have been forgotten for so long as a way of gaining public support and trust is increasing policy interest in rural electrification programs. Kerr and Newell (2001) claim that government entities that implement projects depend on these policies to make sure that projects installed in those areas meet certain preconditions and post-conditions. Even though policies do not force contractors or those initiating projects to include project recipients in those projects, Kerr and Newell (2001) claim that policies should engage people from various sectors so that they can meet preset requirements and even those set once projects are completed.

Under normal circumstance, governments develop policies with a view to pursue social goals together with address failures in societies so that they can promote economic efficiency (Kaiser and Ahlemann, 2010). As a result, such policies are developed with a view to help government distribute or redistribute resources so that there can be fairness in their distribution. However, this should be done at no cost or at minimum cost (Kaiser *et al*., 2010). Otieno and Graca, (2010) claim that ideal policies that address themselves to project implementation should focus their attention on project effectiveness by ensuring that the processes of implementing projects are set in ways that meet institutional, socioeconomic and regulatory goals of their recipients. Furthermore, good policies should ensure that projects are implemented in cost effective manner and that stakeholders are treated fairly without discriminating some of them (Otieno *et al*., 2010). Njoki, (2013) claims that they should focus on ensuring that projects are implemented with high levels of integrity so that informed decisions making processes that require public infrastructural projects to base their implementation processes on accurate information and even make sure that basic requirements are adhered to.

Business and electricity regulations that are not specific might hinder the implementation of projects. Accordingly, as policy makers focus on promoting expansion of energy projects in various part of the country, they need to ensure that those regulations are in tandem with emerging technologies in the sector. This means that the existing regulations might need to be reviewed to streamline them to the current needs in the market. In addition, they should be geared towards supporting the small emerging projects in the sector so that they can encourage private investors. This is in relation to the fact that majority of the existing policies are geared towards mega projects meaning that the small one such as those on 100-watt might not be addressed in the right way. As such, they might face legal hurdles faced by 100-MW power plants. Since all projects in the country are supposed to adhere to certain regulations, then it means that small projects might not be implemented or when implemented they might various regulatory challenges. A one-size-fits-all regulation can thereby bar small companies from engaging in energy sector (Pham and Nguyen, 2011).

World Bank (2002) highlights the need for transparency in public sector meaning that projects should be open and clear. In this respect, government policies should be linked directly to project budgeting, planning and financial requirements to ensure that projects are implemented in transparent manner. Macharia and Ngugi (2014) claim that government's policies play major roles in guaranteeing the success of mega projects in the country. They claim that those policies influence project performance, conduct, structure and sizes. As such, they help them to be implemented in the right way.

The number of people who lack electricity in the Less Developed Countries (LDC) has changed little over the last four decades. In 1970 the total was 1.6 billion and remained nearly constant during the following three decades, with small variations up and down. In the early 2000s, the number of such people stood at 1.59 billion. This reduction even though it is relatively small has been as a result of major investments in energy sector that have been made in Brazil, China, South Africa and India (Zhang and Banerjee, 2012). This suggests that very little has been done in LDCs. There are two major factors that contribute to this. Firstly, most of these countries are poor; as such, they lack funds to invest in this area despite the significant impact it might have on their national economic development. This is worsened by the fact that

majority of the poor people living in these countries may not afford to pay for electricity they use at home. Secondly, those in political offices lack the political goodwill. As such, they do not invest heavily on this issue or even do not focus on formulating policies that would promote the supply of electricity to the rural areas (Tomas and Sanchez, 2013).

The issue of energy access gained highest prominence in the political area in 2012, when the UN identified the year as the year for Sustainable Energy for All people and went ahead to adopt Universal Energy Access by 2030 as part of its main agendas. The European Community, World Bank and most Bilateral Aid Agencies have endorsed this UN target and we can now consider that the political will issue has been overcome (Thomas and Anand, 2014). However, on the economic side, a lot of money is required to ensure that everyone has access to affordable energy. This is in spite of the fact that economic conditions in most of LDCs has not improved. If anything some of them have worsened; thus, there is lack of funds to finance such activities to ensure that everybody will have access to electricity by 2030.

Government has a major function in providing basic services to the members of the public. Accordingly, some of the people argue that any government should provide water, energy, health facilities and education to its citizens. Accordingly, as individual governments work around to reorganize their energy sectors, they have a responsibility to distribute it to the areas that have been marginalized for many years. In particular, it has to supply it to the people who cannot afford because that is part of its basic responsibilities. Such a move is critical in the distribution of energy to every part of the country. Accordingly, it may focus its attention to private sector that can be encouraged to reach the people who might be hard to reach due to their geographical locations or ways of life especially the nomadic people. This means that the national government can collaborate with private firms to ensure that all people in the country have access to electricity be it renewable or the non-renewable one (Singer, 2014). However, when access to off-grid energy is promoted without increasing demand, energy projects may not be sustainable in the future. This raises the question whether energy option would be sustainable (Chaurey, *et al.*, 2010).

Ensuring that there are sufficient skills to support energy sector is also an important aspect in this sector. Accordingly, educative programs aimed at sensitizing the members of the public to know what they can do to access energy and protect environment is an important aspect (Hande and Surabhi, 2015). Besides, marketing strategies can also be important in promoting the success of technologies that are used in the energy sector. Accordingly, building capacity in all areas that would be involved in marketing energy sector would be critical. I all this effort, development programs promoted by various ministries in the government would be critical in rural electrification activities (Terri *et al*., 2015). Consequently, majority of the countries have turned their attention to this strategy to encourage the members of the public to connect to electricity as a way of improving economic development.

Local governments are also critical in development of energy related policies. They help in addressing jurisdictional issues that hamper the processes of connecting the members of the public to electricity (Mills, 2014). In line with this, they are playing critical roles in the promotion of renewable energy, which is becoming important in health facilities. This is particularly evident in remote areas where fuel costs are relatively high due to transport costs and other emerging issues. Similarly, according to a study by Reddy, (2015) it is evident that various government entities use renewable energy technologies to reduce the cost of powering projects among poor communities.

Access to energy is an important aspect in poverty reduction. No wonder some of the government entities address poverty challenge by connecting people to electricity. In this respect, the International Institute for Environment and Development (IIED) has linked poverty reduction to access to energy. Therefore, programs to support these populations should ultimately focus on providing basic social services, such as energy, health and education (Wilson and Neha, 2014). In all this, electricity is a major element in provision of health services. Nevertheless, most of health facilities in the world are not connected to electricity. A research conducted by Practical Action, (2014) established that about 30% of health facilities within the Sub-Saharan Africa did not have access to electricity. It further established that 46% of such facilities in India were equally not connected to electricity. Alongside this challenge, is the fact that majority of energy supply activities in most of these parts of the country are

unreliable. Accordingly, even when connected to national grid, they often suffer from frequent power outages. Because energy sector is a major contributor to good health, it means that those facilities do not offer quality services. Hence, the safety of the members of the public is not guaranteed (Kamalapur and Udaykumar, 2011). This is not an exceptional case because in the absence of reliable power, most of the health facilities especially those in remote areas may not be able to maintain most of their life-saving machines. This possess a major barrier to the realization of health coverage for all in such areas and countries; hence, unless LDCs invest heavily in power, they will not be able to offer quality health services.

Access to energy is particularly an important aspect in health sector because it affects the health of mothers and the in - born. In contrast to other clinical procedures, childbirth cannot be withheld till morning to wait for daybreak. Studies show that about 289,000 women die during childbirth and complications related to that clinical procedure. Even though there are no sufficient data on this issue relating to correlation between the two, it appears that energy access could reduce significantly the number of children and mothers who lose lives during childbirth. In light of this, the UNs' SE4All initiative identifies the important role that energy plays in promoting the health of women as they give birth. This means that energy can make a significant impact in this area; thus, the UN in collaboration with WHO have joined hands to make significant contribution in this area through energy sector (Mills, 2014).

With more than 50% of children in developing countries attending primary schools without electricity, expanding energy access is critical to supporting educational goals and priorities. According to a study by Practical Action (2014) doing so would extend learning hours which could in turn help in serving more students, enable students to study even at night and allow school administrators to use better ways of teaching. This could be critical in the use of technologies in schools, enhance the process of providing meals to students and even improve class environments by controlling temperatures where necessary. The support that would be given to education would obviously help in generating income that can in turn support effective measures of distributing electricity to rural areas. A report by IEA, (2011) showed that even if lack of electricity was also possible in urban areas, it was relatively high in rural areas because about 84% of the people who did not have access to energy were from rural areas. This

obviously hampers agricultural activities, which are normally the sources of income for majority of people in rural areas. Nonetheless, with increased energy supply to rural areas, the ministries of agriculture are on the verge of improving this condition through partnership programs with ministries of energy.

2.4 Project Service Outsourcing and Implementation of Energy Access Projects

Project service outsourcing allows project owners to use the resources of other firms to execute their projects. It thereby enables them to benefit from expertise outsourced elsewhere to the extent they are able to mitigate risks and manage costs so that they can direct existing resources to other activities within their core operations. Franz and Bozhil, (2014) noted that project service outsourcing helps organizations to deliver on their mandate by making use of best practices in their industries that can only be attained by companies contracted to offer those services. The practice shifts the burden of responsibility to outsourced companies thereby it is critical particularly in mega projects. Outsourced companies capitalize on their internal economies of scale because normally they are competent in the services they are contracted to offer. This helps them to overcome some of the challenges that project owners encounter for lack of internal capability. In so doing, it becomes critical for companies that do not have internal capabilities to outsource services rather than focus on developing the internal capabilities they do not have.

In public service, government entities are normally the ones entitled to oversee the processes of extending electricity grid. In contrast, in private sector, community groups and private enterprises are the ones that carry out the electrification process. Normally, the private sector would be the quickest model for providing electricity to people who do not have access to it if it would be supported through policies and regulation. To address this challenge, some of the sectors such as banking and telecommunication have developed innovative ways of providing electricity by partnering with private sector. As a result, the convergence of communication technology and energy has developed new opportunities for the energy sector to engage a similar practice (Tenenbaum and Chris, 2014). It would be worth noting that small entities such as SMEs act as the best models for distributing energy services to majority of the people living in rural areas. In line with this, Mills, (2014) notes that if SMEs would be supported then

they would offer better services to local people because they understand their needs. Accordingly, they would be able to develop support services and distribution channels in those areas to help energy sector develop further. This would help local people own such projects and even create jobs for local people thereby contribute in promoting development in those areas.

In almost every part of the world, SMEs are capitalizing on their simpler and efficient models of making decisions to tap into innovative ways of doing business in various areas of life. Accordingly, majority of the countries in the world have started seeing these business enterprises transform their energy sectors. With the help of advances witnessed in communication, some of the companies that offer energy related services such as M-KOPA, which is a local company, have devised means for enabling consumers to acquire solar panels and pay for them over a specified timeframe. This helps them to acquire energy devises at the rate they can afford to pay for them. As a result, most of such companies have been able to attract customers they did not have before thanks to private means of financing. While the practice is yet to be embraced widely, it introduces a new system of finance among developing countries (Wilson *et al.*, 2014). Kishore and Gopal, (2013) suggest that while this offers business opportunities to small enterprises, it also offers similar opportunities to bigger companies, which are able to reach many people. This means that multinational companies that engage in energy sector would be able to venture into the local energy sector and invest more. This would be critical to the local energy sector; as such, it would be necessary for them to consider investing in smaller enterprises.

The process of working directly with customers to help in developing affordable energy products and services largely lies on the hands of small scale businesses because it helps them to increase their customer bases. However, some of these business enterprises are currently working hand in hand with bigger companies to leverage their retail businesses. Nonetheless, the one-size-fits-all model is yet to succeed in this business space; accordingly, some of the small scale enterprises are developing integrated business-to-business partnerships with companies that enjoy national outreach. Desjardins and Chris, (2014) in support of this model, note that the partnership is able to help SMEs develop better relationships with customers,

promote their brands and even equip them with marketing powers that emanate from established business enterprises. A good example is provided by One Degree Solar enterprise that develops solar systems for radios, phones and other devices in partnership with Coca Cola Company.

Technology customization and standardization emphasizes that it is the technology on which a business model operates on that thrives (Murphy and Sharma, 2014). Technology optimization thereby helps in scaling up energy projects. Considering the rural settings of developing countries such as India, it becomes necessary for entrepreneurs and energy companies to innovate technologies that are more user-friendly. Certain parameters are to be considered by the actors while devising their innovations, such as, the technology should be compatible with the region's physical and social settings and should be easy to handle/maintain by rural beneficiaries. Hence, developing and implementing certain technical standards helps in maximizing the business model compatibility, ease in operation and maintenance and replication or scale up of the project in future.

The technology needs to be built in a way that it addresses the needs of area where it is being implemented and can be easily handled by the local communities. Unless the technology addresses the needs, there would be no ownership of the system which results in its failure (Palit and Krithika 2014). Their study was well illustrated through example of cookstoves in India, which did not witness a large-scale uptake by users. Over the past two decades, the need to reduce indoor smoke emissions and even reduce over reliance on firewood has forced the Indian government with the help of local and international NGOs to introduced improved cooking technologies in the country. Nonetheless, the results of the outcomes have been mixed. The first of such initiatives known as the National Programme for Improved Cook stoves (NPIC) that was launched in 1984 supplied about 120 million cookstoves that were energy efficient to households in 23 states. The program sought to address the deforestation challenge in the target states by encouraging the members of the public to use biomass, improve health and even save girls and women from the burden of collecting firewood every time they sought to cook food for their families. In line with time, about 34 million of such stoves had been distributed by government by 2002.

National Programme for Improved Cook stoves (NPIC) was brought to completion in 2002 with top down approach being one of the major shortcomings. Another challenge was that the subsidies provided by the government went directly to stoves, but the companies that produced the cook stoves did not address the needs of the people who used them. As a result, majority of the target households did not use the cook stoves because they did not fit their needs (Hanbar and Karve, 2002). Also, subsequent impact assessment studies revealed that the program did not contribute in any way to saving forests from deforestation. To make the matter worse, the monetary savings provided by the Ministry of Non-Conventional Energy was way too high than the actual one. The NPIC cook stoves made by networks of trained local artisans were criticized in terms of meeting minimum quality standards. In addition, they failed to be efficient than the conventional ones making it non-beneficial to users in terms of fuel savings or reduced smoke levels (Kishore *et al.,* 2013).

It is thus important to ensure that the technology should not only depend only on technical efficiencies but also should be able to meet users' needs in terms of matching social, cultural and economic preferences. And, this explains that due to lack of considering these preferences have resisted the efforts to scale up access to improved cook stoves till date. Engagement with the private sector also leads to an improvement in program effectiveness (beneficiary achievement of intended results) and/or efficiency (reduction in the rate and/or cost of program delivery). This benefit often comes because of the private sector provides a unique set of skills, technologies, or expertise that is not necessarily available within public or non-governmental organizations. According to Tien and Sharma, (2011) about 33% of the alliances assessed in their research measured and/or identified expertise as the primary contribution from the private sector. Businesses contributing expertise tended to be active strategic partners as well as providers of resources beyond financial capital. Of course, financial and product contributions can also yield increases in efficiency (for example through economies of scale) or effectiveness, but initial data suggested that private sector skills, technologies and expertise may offer especially valuable ways to improve effectiveness and efficiency.

Studies done on supporting the replication of inclusive business models found out that customization of energy access model is required at sub-national level while adopting a model from the other nation and then standardizes it for further dissemination at last mile (Krämer and Köcher, 2014). Their study noted that very often the capacity of a plant is designed keeping in mind the local resources and the size of the population to be served but then the mode through which electricity would be generated and the supply is kept the same for all the beneficiaries. A similar study was conducted by Malviya, (2011) who noted that Off-grid energy model in Chhattisgarh is one such model that displays a successful demonstration of technical customization up to an extent and then standardizing the model to cover large number of villages which aids in smooth after-sales in a structured manner. In order to provide electricity in Chhattisgarh through renewable energy sources including off grid/decentralized energy systems, Chhattisgarh State Renewable Energy Development Agency (CREDA) was created.

Most of the un-electrified villages in the state are in the tribal dominated districts of Sukma, Dantewada, Narayanpur and Bijapur. CREDA initiated with the solar home system (SHS) model in 2003 which could not sustain longer mainly due to two major reasons. First, heavy subsidy on the system could not make the beneficiaries realize the value of these systems and whenever the system owner faced any financial crunch they would mortgage the system at a low price. Secondly, there was large scale social problem of theft that negated the purpose for which the project was deployed for (Malviya, 2011). This led to exploration of option of installing solar mini-grids by CREDA and therefore, the first mini-grid was commissioned in 2004 without discarding the SHS. Solar mini-grids provided supply to larger villages with concentrated settlements whereas SHS were utilized to provide energy to areas with scattered households.

A key attribute of the CREDA model, which contributed to the significant ease of operation, cost minimization and maintenance, has been the technical standardization in terms of different capacities and inverters. They have plants providing six different capacities but they are connected to only two inverters. The systems with 1-3 kWp of installed capacity have a battery-bank of 48V and inverter rating of 3 kVA and the systems with 4-6 kWp capacity have 96V

battery bank and inverter rating of 5kVA. Instead of having different sizes of inverters at different villages, thereby increasing the maintenance cost, CREDA have standardized and kept two inverters spares which otherwise have to be six spares for six different capacities (Arabinda, 2011). Further, in the installations that have been done lately the civil structures have been standardized with their rooftops fitted with batteries and inverters, which are normally stored in rooms unlike the former structures where solar panels that were mounted onto the grounds and even fenced around to secure them. This reduces the maintenance cost part of which went to fencing and mounting the panels to the ground. These are some of the factors that enhanced the success of the project. It is thus against these arguments that the current study attempted to evaluate the influence of project service outsourcing influence the implementation of energy access projects in underserved counties in Kenya.

2.5 Project Fund Mobilization and Implementation of Energy Access Projects

Funding processes are critical in the execution of national energy infrastructural projects (Njoki, 2013). She claims that in the absence of clearly outlined funding process, the implementation of such projects would be hampered greatly. Macharia *et al*., (2014) claim that funding processes within public sector are normally hampered by contractors with insufficient funds to fund their projects. Accordingly, any funding process should consider the cost of construction materials, labor and equipments used during the implementation of a project (Otieno *et al.,* 2010). Accordingly, Otieno *et al.,* (2010) claims that funding process is a vital element in any public sector because without it projects might encounter financial difficulties. Even though contractors ought to have their own money to fund part of the project before they receive full funding from the government, funding processes that are not clear and effective may be a big challenge to public sector in the country. This argument is supported by Kaiser *et al*., (2010) who claim that poor funding processes may force contractors into using sub-standard materials. They also claim that communication processes may be hampered by inadequate funding processes thereby projects may be delayed and even result to unreliable suppliers. Wanjiku (2012) while evaluating the factors that influence the way contractors perform, claims that unstructured funding processes may result to poor workmanship, financial challenges and projects of low quality.

In any funding process, measures should be put in place to ensure that the available fund can be relied upon (Esty and Christoy, 2002). Efforts should be made to ensure that projects would be able to cover up all their costs and that they would not end up into debts, risks should be shared, a debt repayment process developed, and all sources of fund should be identified right at the start of project. This is not exceptional because concerted effort should be made to ensure that project will run to the end once started. Otherwise, there would be no need to start a project when it is expected that it would fail at some point. This argument is supported by Daube and Alfen (2008) who upon comparing forfeit model and project financing models of Public-Private-Partnership (PPP) in Germany claimed that cash flows, contracts and assets were important in the execution of those projects. In addition, they noted that funding processes should be flexible to adapt to the various needs of different stakeholders during the implementation process. In conjunction with Hainz and Kleimeier (2006) the authors claim that the funding process plays vital role in project execution.

Huge sums of money in USD billions have been set aside to enhance the process of distributing energy to various parts of the world by 2020. Out of this, Kenya has managed to secure about 3 to 5.5 USD billion meaning that there is a gap of about 14 or 18 USD billion that need to be sourced elsewhere (Power Africa, 2017). The finance estimate provided in this case includes the ongoing projects, which are expected to complete post-2020 and the on-grid connection for about 70 or 80 percent of the members of the public. Studies from South Africa show that connection fee normally increases once connection rate reaches 85 percent. The off-grid solution would therefore be a good solution for this challenge particularly in Kenya.

The Government of Kenya has to this end acknowledged the fact that it will require to mobilize different groups of people for it to achieve its goal of distributing electricity to every home in the country. Accordingly, a broad based structure of project ownership will be developed in the rural electrification scheme. According to a report by Power Africa, (2017), projects that are led by government, members of communities and private firms will in future be encouraged to apply for subsidies in their capital goods. In addition, different models will be developed to encourage private firms to engage in the electrification exercise. This partnership will be critical in the project going forward. The emphasis here will be on demand meaning that the

program will be demand-driven. Accordingly, community support will be critical in the implementation of the rural electrification programs in the future to ensure that the program will be sustainable. For this reason, project sponsors will have no option other than comply with qualifications that will be provided to them.

Financing electricity access for the poor is a major challenge, and even more so for the poor in LDC. The International Energy Agency (2011) approximates that nearly US$48 billion per year from 2010 throughout 2030 (nearly US$ 1 trillion) will be required to meet the UN's target of distributing electricity to about 90 percent of the people. Actual investment in energy access is much smaller. For instance, in 2009 the total investment in this sector was only US$9 billion. Concerning future investments, the IEA estimates that under the new policy scenario, the expected investment on electricity access in the coming years amounts to US $13 billion per year combining all financial resources (aid, public funds, and private investment), which equates to about a quarter of the amount required. This leaves a funding gap of US$35 billion per year between 2010 and 2030.

Table 1.1: Ongoing Donor Funding for Grid and Mini-Grid Electrification (US$, millions)

Donor	Grid Electrification	Mini-grid Electrification
World Bank	275	11
African Development Bank	150	—
EIB	65	—
EU	38	—
AFD	212	36
GIZ	—	8
KfW	—	16
DFID	—	40
Embassy of Spain	—	16
Nordic Funds	—	4
Total	**740**	**131**

Source: World Bank Analysis (2017).

The unit cost of supplying electricity in (US$/kWh) from either off-grid or grid to people living in isolated small villages in rural areas is normally relatively higher than that for distributing

it to people living in peri-urban or urban areas. In spite of this, poverty levels in the country and other developing countries are relatively high. A Rural Poverty Report that was carried out in 2011 showed that about 71 percent of the people who lived in rural areas made less than US$ 1.25 on daily basis. Throughout the world, poverty levels remain relatively high in Africa and South East Asia. In spite of this, majority of the people living in rural areas live in isolation, they lack basic infrastructures and even do not have access to market to sell their farm produce. Accordingly, their ability to make money and improve their living conditions are hampered significantly (IFAD, 2011).

In the light of these challenges, the poor people living in rural areas cannot meet their respective electricity needs let alone connect to national electricity grid. As a result, the magnitude of financial gap for connecting to electricity among the poor is relatively high and to make the matter worse, there are no definite efforts to fill the gap (Tomas *et al*., 2013). Two fundamental questions arise out of this situation. The first one relates to where the money to fill the gap will come from whereas the second one relate to the extent to which private investors would be willing to invest in this gap. The international leaders hope that private sector will finance the process of distributing electricity to rural areas and among the poor people. The inspiration is inspired by the successes that private sector has made in the past two decades particularly in commercializing the solar energy sector and energy generation schemes. The latter category has been done by taking opportunities where the generation schemes are nearly commercial, hence require small quantities of subsidies to be financially viable.

The energy market from poor families who live in developing countries vary between 250kWh and 600 kWh every year, but none of the two categories from private sector have been able to deliver substantial investment in it. The first effort has provided about 10kWh every year of that demand (because a 10Wp PV system generates approximately 10kWh every year). The second one has in most cases been fed to national electricity grid, which obviously does not end up to poor people living in rural areas. Accordingly, it does not address itself to poor people because it ignores the issue of justice and equity in energy distribution, which can only be attained if electricity would be distributed to the needy poor people living in rural areas

(Sanchez, 2010). A study by Foley and Logarta, (2007) depicts that governments' intervention in the rural electrification of developed countries has been critical following strategies and policies that governments developed. This is particularly true in USA, Germany and Czech Republic. In a similar manner, rural electrification has occurred significant among emerging economies following political intervention and public fund that has been directed towards it. Similarly, according to a study by Mensah and Kemausuor, (2014), in Least Developed Countries, governments' intervention has also been critical in progresses made in rural electrification.

In most cases, the financial viability of distributing electric utilizes depends on revenues generated from the sale of those utilizes and balance cost of installing them and even the cost of providing electric services. As a result, it always does not make financial logical sense distributing electricity to poor people living in rural areas who are sparsely distributed in vast regions and who most of the cases are unable to the initial connection fee. Furthermore, Zhang *et at.*, (2011) observe that the companies that distribute electricity to rural areas often incur high operating costs per every household they provide with electricity. Most of those companies often recruit employees including the top most ones from communities that do not have high levels of education. As a result, they often operate inefficiently.

In order to overcome these challenges and even scale up the financing processes of energy sector, the following strategies have been identified: attracting financial investment from private sector, lowering the interests' rates charged on such financing processes, adopting the right business models and engaging government agencies in this process. Private sector-led economic growth, fueled by private investment, increases economic opportunity, enhances access to public and private services, and reduces poverty (Power Africa, 2017). USAID's history of partnering with the private sector shows that partnerships are most effective when they have deep links between business strategies and development objectives creating intrinsic sustainability.

The context for financing global development has evolved dramatically over the past decade. According to Mardirosian, (2010) private capital now accounts for about 90 percent

of financial flows to developing countries, due to growing private sector recognition of the financial and social benefits of investing in the developing world and governments' expanded efforts to diversify their economies and access capital for social investment. Increased investor interest in developing economies represents a watershed opportunity for governments and development agencies to mobilize the necessary resources to deliver development impact on the order of magnitude required by the Sustainable Development Goals.

The USAID is uniquely positioned to increase private resources towards development with its far-reaching global footprint. This is in accordance with Power Africa, (2017) report that indicates that the agency also has a deep understanding of the country and energy sector context, including relationships with key stakeholders, and a broad set of tools that can specifically address the risk return profile; grants, technical assistance, guarantees, partnerships, and convening power. These attributes also position USAID well as other development organizations, such as development finance institutions (DFIs) who may operate only in later stages or in more established markets. USAID addresses risk and transaction costs, provides support that builds a pipeline of investments for DFIs and the private sector, and draws on deep technical expertise in key sectors (agriculture, water, health, energy, and education) and extensive relationships across the public and private sectors. USAID's Office of Private Capital and Microenterprise aims to leverage private capital and expertise on an agency-wide basis to improve development and increase the funds available, while also transitioning developing countries to freer, more transparent, and more stable market economies.

In a report by Koh, Karmachandani and Katz (2012) titled: From Blueprint to Scale, this report identifies four essential stages in the process of scaling up undertaken by a sponsoring firm. These were identified by analyzing projects funded by Acumen Fund and Monitor Group in Africa and India. The main thrust of the report deals with what and how impact investors and philanthropic aid can help and can play integral roles in each of these four stages, leading to successful scaled interventions. These stages are: Blueprint, Validate, Prepare and Scale. This study also reported that Husk power systems (HPS) owns and operates decentralized biomass based mini power plants (30-50 kW), serving rural consumers in the state of Bihar in India. It

was set up in 2007 by first generation entrepreneurs in one of the least electrified states of India where only 10.4% of the rural consumers have access to electricity according to the census of India in 2011. The company since its inception has installed 84 mini-power plants in a period of four years thereby has been able to provide electricity to about 200 people living in 300 villages over six districts in Bihar. Each of these plants achieves operating break-even on average within six months of starting operations.

An example of impact investment in the energy sector would entail issuing a government-backed power bond that would be linked to sovereign Power Sector Modernization Package. In developing such a bond, it would be necessary to improve the process of acquiring land from the members of the public, develop revenue models for KETRACO and Geothermal Development Company, and ensure that the money that would be raised from such a venture would enable the responsibility of the government to upscale its on-grid distribution and develop facilities for social impact investors that would be linked to off-grid electrification (Power Africa, 2017). If such a measure would be implemented in totality, it would be possible to address some of financing challenges experienced in the energy sector. Additionally, the solution would contribute significantly to developing a long-term measure that would be able to reduce electricity tariffs by between 6 and 12 percent. This solution would reduce the government's burden to finance the sector by up to 60 percent (Power Africa, 2017).

The ability to leverage grant funding and secure private investment from investors is in fact one of the critical drivers of HPS's growth. From taking the business model from blueprint to validation stage, grants by Shell Foundation proved to be a key factor in India's energy access funding strategy. Shell Foundation provided a series of targeted grants which were conditional upon initiating changes in the business. In all, Shell provided a total of $2.3 million to HPS between 2008 -11 (Koh *et al.*, 2012). Sadeque, and Soni (2014) in a related study found out that the grant funding from Shell helped in creating the core components required for scale for example, in designing its business strategy, recruiting senior managers, building awareness about the HPS brand, funding R&D activities to decrease capex for plants, for developing the smart meter and importantly leveraging Shell's global expertise to dramatically improve the safety for its operational sites with a view to reducing the likelihood of its high-impact risks.

It is therefore evident that grant agencies and impact investors have clear measurable and reliable indicators for assessing scalability of enterprises, which is seldom seen in government driven programmes.

Public utilizes need to be strengthened by transforming financial operations and capital expenditure in KenGen and Kenya power. This should be supported by other forms of financing including vendor financing together with issuance of new shares to the capital market. However, over the years, priorities for the energy sector have changed due to technological developments witnessed in the sector. Accordingly, there is the need to ensure that electricity would be affordable, reliable and cost-effective (Binz, and Ron, 2015). Besides, market forces are also transforming the sector. Private companies for instance are offering more choices to customers and some control over electricity, which Kenya Power does not offer them. At the same time, the public knowledge about wind and solar power is also increasing at a high rate. As a result, unless the government-owned companies change their market approach, they are likely to be ousted by private investors despite the monopoly they enjoy.

New grid configurations and technologies are able to offer traditional services more affordably, reliably, safely and even reliably. As such, the institutions that govern electricity generation and distribution in the country should transform to embrace these changes. Nonetheless, this will depend largely on institutional ownership. For most of the people who consume electricity, private companies are best suited to provide electricity services (Malkin, and Centolella, 2014). Accordingly, the commissions that regulate energy sector should align IOU incentives to market forces rather than forcing the market to conform to their desires. It is thus against these arguments that the current study attempted to study the influence of project fund mobilization on the implementation of energy access projects in underserved counties in Kenya.

2.6 Project Company and Implementation of Energy Access Projects

Accessibility to energy access electrification is facilitated through the implementation of rural electrification projects (REPs). A great deal of research efforts has been made to determine the factors that influence project implementation. Major contributions in identifying and

examining critical performance and success factors have been made. Maloney (2008) evaluated project performance in relation to quality, time and cost to determine whether objectives were met. In spite of this, success in project completion should go beyond meeting performance, schedule and cost specifications. Parfitt & Sanvido (2006) suggest that expectations and goals in a project relate to different elements some of which relate to educational, professional, social, financial and technical issues. In addition, they evaluated the success factors of a project using quantitative measures. They established that experience was an important factor in the success of projects.

To improve the way in which contractors perform, contractors are normally advised to focus much of their attention on time, maintain stable workforce, establish partnership programs with sub-contractors and reduce delays. In addition, the success of project implementation would also depend on identification of insufficient communication processes, adherence to mutual goals, staff empowerment, and dealing with excessive demands from partners at an early stage (Xiao and Proverbs, 2008). The electricity industry is made up of a complex system where different factors are involved. Key among them is reliable services especially in electricity delivery, which has significant impact on the industry. Country governments are also important in this exercise because they formulate part of the policies that can be critical in promoting the distribution of electricity.

Most of the private investors in the country use Engineering, procurement and construction (EPC) contracts to undertake large-scale projects. Under EPC, contractors are supposed to deliver projects to developers once they complete them; hence, such contracts are at times referred to as turnkey construction contracts (Damian, 2011). Besides delivering complete projects, contractors are supposed to deliver those projects within specified timeframe. Failure to comply with these regulations, they might incur monetary liabilities (Gloria and Carstens, 2011). Jan and Harry (2015) found out that it was about time that EPC contracts were examined. Contractors have so far suffered huge losses thereby most of them are never willing to enter into contracts with EPC within certain jurisdictions. This problem is worsened by the tight insurance market in the country.

EPC contracts are now becoming forms of contracting method among private firms in large-scale construction projects. To a large extent, this is because every project requires a contract that should be managed effectively. Otherwise, the parties involved in a project may be affected negatively by possible negative outcomes. Normally, when contracts are not managed effectively, they impact projects negatively. Such eventualities might result to delay in project completion, cost overruns and compromises on the quality of projects. Unlike in the past, nowadays most of contractors refuse to enter into contracts because of such eventualities (Jan *et al*., 2015).

Most EPC contracts cover site management, project management, supervision, civil works and performance guarantees among other things. Clients are thereby expected to take care of some of the things that might be required in project implementation. For instance, site preparation activities are left to them to decide what needs to be done (Gloria *et al*., 2011). Nonetheless, because of their flexibility, EPC continue to be important aspects in large-scale projects in various countries.

Over the years, contractors have become more averse because turnkey solution is not that simple as it sounds. According to Jan *et al*., (2015) contractors seek to exclude themselves from possible liabilities whenever they negotiate contracts. Accordingly, they demonstrate their tendency to prefer less risky projects with highest gains. Similarly, clients attempt to transfer a lot of risks to contractors as much as they can during contract negotiation. Despite the growth of such practices in contract negotiations, the researcher believes that EPC contracts will continue to play major roles in large-scale projects.

In traditional project-financed power projects, there was Power Purchase Agreement (PPA) between local government authorities and project company. Local authorities undertook to pay some fixed amount of money every year to project companies regardless of the possible outcomes. This is according to a report by UNCTAD, (2015) which indicated that power purchaser was responsible for providing fuel. This eliminated project company, which was one of the risk variables even though it limited the flexibility of operational activities. In absence

of PPA, lenders and project companies do not have guarantee of cash flow like they would do in its presence.

Rolffs and Ockwell, (2014) claim that time, quality, and cost are the major factors in energy access contracts. This can be said of EPC contracts even though these contracts deal with complex issues. EPC in broad sense are designed to satisfy acceptability requirements of lenders. It designates responsibilities of designing, procuring, engineering, constructing and commissioning to contractors. Accordingly, any problem that arises in a project should be directed to contractor to fix it and in some instances compensate for any possible loss. For this reason, if several entities are included in a contract program, then EPC contract should specify that all of them are liable for any loss.

The risk of cost overrun and any possible benefit in a fixed contract price is directed to contractor. Accordingly, contractors have limited abilities to claim for additional funds in case projects are delayed or vary from estimated amounts. EPC contracts have fixed completion dates. Accordingly, if these dates are exceeded, then contractors are liable for delay liquidated damages (DLDs). These damages are intended to compensate for losses that clients suffer as a result of delays. However, for these damages to be enforceable, they should have genuine estimates determined at the start of project (Rolffs *et al.*, 2014). Against these arguments, the study therefore attempted to evaluate the influence of project company on the implementation of energy access projects in underserved counties in Kenya.

2.7 Combined Rural Electrification Expansion and Implementation of Rural Energy Access Projects

Researches on rural electrification and implementation have been conducted and the link between the two factors linked directly. Most researchers addressed their studies on how to foster implementation of projects during execution phase and measured when executing or after completion of the projects (Mathieu and Gilson, 2008). Various scholars argue that factors that affect rural electrification and implementation require to be investigated. They further alluded to the fact that when individual interests and goals relate harmoniously with overall group goals, then it is anticipated that both individual and overall productivity increases

(Baumeister and Bushman, 2010). Therefore, such relationships in any organizations are likely to improve or derail the implementation of projects. As a result of these arguments, and basing the study on the various scholar's recommendations, this study attempted to establish the extent to which combined rural electrification expansion strategies influence the implementation of rural energy access projects in underserved counties in Kenya.

A study by the World Bank, (2017b) examined how the combined influence of private sector, government, donors, rural communities and academia together affected the implementation of energy projects. The study sampled five districts in Zambia where energy access projects were implemented. The key findings from the study indicated a positive correlation between the Rural Electrification Strategy and policies that were developed to safeguard this strategy. When all parties drive a common goal but negative correlation when there is a conflict among participating key stakeholders. Thus, the current study considered project planning, project service outsourcing, project fund mobilization and project company strategies when assessing implementation of energy access projects. The establishment and implementation of the Rural Electrification Strategy is relevant to the achievement of objectives set in the rural electrification programs. Once a framework for rural electrification program has been set, private sector, community-based organizations and donors among other relevant stakeholders should be involved in developing electrification agendas with a view to promote universal coverage.

Moodley (2002) notes that stakeholder collaboration is a crucial element in the success of every project. There is no doubt that stakeholders are many in every project. These people vary in their degrees of influence, urgency and legitimacy in project. Accordingly, their nature and number vary from one project to the other; hence, it would be sensible to evaluate them before a project is implemented. A study by Menoka (2014) notes that stakeholder collaboration can occur in different forms throughout project cycles. Accordingly, all of these people need to be included in a project to determine their possible influence on its performance. It should therefore be understood as a process through which all these people collaborate with each other in a project.

An Indian based solar company known as SELCO believes that poor people can afford to buy and maintain sustainable technologies, hence, rural electrification project should be commercialized (Singh, 2015). In spite of this belief, according to Desjardins *et al.,* (2014) these people can be sensitive to risks; hence, are unlikely to obtain products and services from companies they do not trust. In addition, they may not buy technologies that are unfamiliar to them. In such a case, government's intervention might be critical in improving consumer trust through various means. For instance, they can invest in creating awareness, setting quality standards and offering incentives to attract such people to use products unfamiliar to them. Yadoo, (2012), further noted that beyond doing this government can focus on the potential of rural electrification to help people understand the importance of connecting to the national grid. Training programs in this case may be instrumental in improving the level of awareness and even supporting local technicians and interested parties. This might highlight the importance of energy sector to agriculture and other sectors to ensure that energy projects succeed in the future. Besides, governments should ensure that the members of public are provided with knowledge to understand the importance of various high-efficiency appliances.

Governments are able to create awareness among the members of public concerning energy access options. This includes the technological solutions to their businesses and financing models among various levels of government and policy makers. This could be critical in the process of developing sustainable policies and developing requisite market interventions to attract private sector into the energy sector (Singer, 2014). Further according to the study by Mohammad, (2017), efficient policies are always possible when they are based on market data related to information obtained from potential consumers, when there are clear grid extension plans that relate to time and cost, when there are effective business models and when there are a variety of off-grid energy options. Furtherance of the existing PPP programs in the country would also be important in such a process just the same way it would be important to interact with market players. For the countries where governments are the only providers of energy resources, it would be important to create more awareness among the members of public concerning the pros and cons of engaging private sector into the energy sector. Policy makers should also be educated on various issues especially those related to projects' feasibility, the

benefits of renewable energy, the benefits of energy access and issues related to climate change in relation to energy sector.

A study by Walker and Lloyd, (2016) recommended that people who regulate utilities need to understand the goals of a government related to off-grid access. Accordingly, these people need to be informed about the potential of mini-grids together with other energy producers. Besides, they need to embrace the importance of transparency in running such programs so that they can resolve issues of concern. These people can more often than not be reluctant to embrace new technologies because of unnecessary concerns about hose technologies (Mohammad, 2017). Technical support may therefore be important to them and hence should be considered to be part of the overall stakeholders.

Investigations examining the relationship between project financing institutions and implementation of energy projects indicated mixed results. This means project financing institutions willingness to invest vary differently based on the markets under study. This was established by Bardouille and Hendrik, (2012) who stated that the financial community comprised of many players such as local banks, donors and private investors. If financiers do not understand projects and their particulars, they are unlikely to invest money. And if they invest in such projects, they normally increase the level of risks; hence, projects are priced highly.

In a related study by Guay and Stewart, (2014), they found out that government was able to establish awareness programs that specifically addressed themselves to financial institutions. Such programs focus on informing those working in financial institutions the best processes and products would be effective in their lines of interest. When they do this, they allow financial institutions to utilize integrated information to make informed decisions. Technical support may therefore be important to financial institutions to help them better their understanding of certain issues in the energy sector. In line with these arguments, the current study sought to establish the combined influence of rural electrification strategies on the implementation of energy access projects in underserved counties in Kenya.

When local people understand their responsibilities and develop senses of ownership to publicly funded projects, they improve the prospects of energy projects. Further a report by UNDP, (2009) indicated that most of SME business models had community members as part of their partners. Such models acknowledged that local people could be instrumental in their success. In the energy sector, local people can be instrumental in facilitating the success of rural electrification projects (Singer, 2014). They can offer certain services that would sustain projects in the future. For instance, they can act as impetus for local people to pay electricity bills on time failure to which they can take localized actions that are acceptable among them.

Combined influence and participation among various stakeholders would most likely improve on the performance and implementation of projects. Some studies support the argument that there will be few conflicts during implementation of projects if engagement among various stakeholders is fostered (Yadoo, 2012), while other studies talk of awareness and cohesion in such groups (Isoun, 2014). Closer collaboration among stakeholders is more likely to possess a diverse range of commonness with regards to knowledge, expertise and talents in coming up with more market-oriented solutions thereby generating better solutions to resolve the existing need (Dunphy, 2004).

Project models were established that made sure that communities that understood their responsibilities together with their possible benefits from projects were likely to succeed in the future (Yadoo, 2012). Accordingly, in Nepal most of the projects seek community approval before they start even if that would mean delaying them before they start. Nevertheless, in some parts of the world, communities are rarely involved in project implementation (Practical Action, 2014). Besides, contractors are selected on the basis of their expertise in executing projects rather than their ability to engage local communities (Power Africa, 2017). Based on this argument, it can be concluded that combined influence affects the implementation of projects by producing results in a more inventive, innovative ideas and solutions thereby enhancing productivity and improvement on return on investment and market-based solutions. Thus, the current study sought to establish the combined influence of rural electrification expansion strategies on implementation of energy access projects in underserved counties in Kenya.

2.8 Project Control Mechanisms and Implementation of Rural Energy Access Projects

Project control mechanisms make sure that projects achieve their objectives by way of measuring and monitoring progresses made in projects on regular basis. This helps in identifying possible variances from desired objectives so that corrective measures can be taken on timely basis. According to PMI (2013), the performance monitoring subsystem is tasked with the responsibility of observing transformations made in a project and reporting possible deviations from anticipated results. Conversely, the decision-making subsystem is tasked with initiating corrective measures whenever such deviations are reported. Overall, project control bases its work on comparing actual results with predicted ones and determining what needs to be done in case of any variation between the actual and desired results (PMI, 2013).

In most cases, project control normally occurs within the execution stage because it is at this stage possible deviations are identifiable. The process normally depends largely on field data to asses and analyze outcomes and even take corrective measures. Accordingly, the process of accessing field data is important in this process. This is normally possible when site management teams work hand in hand with team projects. Because of what project control does in project management it becomes necessary to incorporate its skills in project management right from the start to the end of project so that pre-determined goals cannot be jeopardized. Jackson (2004) observes that the seven fundamental steps in project control process include: developing project plan, establishing benchmarks for the project, monitoring the way a project performs, identifying possible deviations from projected outcomes, evaluating the possible corrective measures, making judgments where necessary, documenting, reporting and evaluating results. Accordingly, for project control mechanisms to attain desired results, then it would be important to understand the following: the process of collecting and documenting data, techniques and tools utilized in the process, the way information technology is utilized in the control process, the threshold skills required during the control process, the right reporting systems and business processes within an organization.

In the process of evaluating project control mechanisms, it would be necessary to understand the importance of including project control mechanisms in the study which is to provide moderation to rural electrification strategies in line with policies that protect service providers

and consumers on the basis of agreement signed between rural electrification agencies and project developers. Martinsuo and Killen, (2014) found out the project control mechanisms help in supervising project implementation and monitoring project development to make sure that projects comply with pre-determined specifications and standards used in projects that are based on rural electrification framework. The supervision role provided by REA ensures that projects supported by rural electrification framework meet the requisite technical and safety standards. It also ensures that appropriate designs are utilized throughout projects' cycles, projects are reasonable and cost effective, they are viable and that they use quality materials. These minimum requirements are critical to any regulatory process. The current study sought to identify the use of project control mechanisms in terms of planning and standardization, engineering design, business models and operation and maintenance in energy access projects. These arguments thus necessitated the need to further attempt to evaluate the extent to which project control mechanisms affected the execution of energy projects.

Most of the times, the actual progress made in projects does not matched the planned ones. This necessitates the need to keep all parties involved in the project informed about the actual progress and the possible conditions that derail projects. Project control mechanisms do not only depend on monitoring process, but they also depend on the manner in which corrective measures are taken to make sure that projects attain desired goals (Frigenti, 2002). Accordingly, on the basis of deviation between actual and planned results, management teams should develop control mechanisms. This is normally done by evaluating variation between actual performance and pre-determined one and it is the responsibility of management teams to identify the useful information. The deviations in this case might result from changes that occur in projects' scope, materials used and time that increase projects' costs.

When it comes to performance, energy companies normally make use of efficient project management tools such as Six-Sigma, Primavera3 and many more that improve the control mechanisms and even augment the process of predicting outcomes. Nonetheless, in spite of these efficient tools, it is not possible to predict the outcomes of projects with high level of precision. Sambasivan and Soon, (2007) observe that when projects fail to complete within

stipulated time and within budgets they suffer greatly, but when they meet anticipated results and satisfy the expectations of majority of stakeholders, they are considered as successful.

Most of the organizations involved in rural electrification processes implement performance measurement models to enhance their business processes. These models help those organizations to develop sustainable methods for sustaining their business objectives in the long-run. Robinson and Carrillo, (2005) observe that by adopting these models, the organizations can be able to develop approaches that enable them to improve their processes on a continuous basis and even develop innovate solutions. Accordingly, the players in the energy sector have begun applying technologies that help them to update their data on timely basis, manage data effectively and serve clients effectively. On the same note, effort is underway to develop integrated information systems capable of serving different groups of people.

2.9 Combined Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

The most efficient project control mechanisms would be the ones that adopt proactive approaches in solving problems and issues that arise in the process of executing projects. Some of those issues may relate to human resources, quality, time, scope and budgets. Failure to resolve these issues at an early stage may contribute to projects getting out of control and therefore to ensure the meaningful gains of any project, then a proper control mechanism must be procured, installed and operationalized. Florence and Wan, (2013) conducted their study on construction industry in Singapore with a view to identify the control mechanisms that enabled projects to be implemented in the right way and even develop predictive models based on those control mechanisms. A questionnaire was utilized to collect data from 16 top firms. The study established that when it was not possible to address issues that rose during project execution, it was necessary to carry those issues forward to the next review meeting. In addition, it established that periodic reviews of project deliverables were important in taking corrective measures. The failure to take such measures was found to result to discrepancies that compounded in the end and affected projects' performances. Florence and Wan, (2013) further concluded that for these deliverables to be achieved, project control mechanism needed to be

integrated within organizational strategies and methodology hence necessitating the need for the study to attempt to address the case of rural electrification expansion strategies and its influence on project control mechanisms.

Project control in project implementation is an important exercise in project management. Eweje, and Kerzner, (2012) did a study on importance of project control mechanisms on project implementations and found out that the execution of project helped in coordinating people together with other resources. Accordingly, it was concluded that project control mechanisms were critical in transforming planned objectives into well-coordinated activities that were vital in allocating and utilizing resources as well as managing people to achieve organizational goals. Hazir (2015) upon reviewing approaches, analytical models and problems associated with project control mechanisms asserted that effective mechanisms needed to be flexible, timely, useful, ethical, accurate, simple to operate and maintain, cost effective and easy to document. Additionally, he suggested that they needed to include methods, tools and policies. The current study therefore addressed itself to the effectiveness of project control mechanisms in terms of planning & standardization, engineering design, business models and operation and maintenance and the extent to which it correlates with implementation of energy access projects in underserved counties in Kenya.

For a market to be effective, all its players should understand the fundamental aspects of that market and their respective roles. This applies to all levels starting from importers to end-users, bankers to policy makers. In this respect, the process of creating awareness among the various sectors would be critical in reducing perceived risks. When new business models or technologies are involved in such processes, the risk perception is increased by lack of requisite understanding because people are normally not inclined to new systems that area unknown to them. Terri *et al.,* (2015), however note that certain risks are higher than others and even within certain markets. As a result, effective education would be critical in such instances because it would increase the willingness of people to work in new markets and improve their effectiveness.

Regulation would be an effective way of developing common frameworks for collecting data where varying methods are utilized just the same way it would apply to the case of integrated platforms and products. This may extend to gap analysis of the common framework with the ones existing in various markets. This would help in bringing them at par for the sake of developing integrated platforms. This may extend to governance and financial disclosure as it is the case in accounting practices. As a result, it would be important to support smaller markets through regulation. Pearson and Rakteem, (2015) pointed out that until harmonious frameworks are developed; the process of implementing projects will remain partial. Nonetheless, market maturity is a critical component in the successful integration of regulation.

A study by Prayas, (2010) on key roles of project mechanisms pointed out that awareness included effort made to create information relating to emergent opportunities in markets, asset classes and new products. This helps in developing high levels of acceptability based on low levels of awareness among local investors. Accordingly, they should cooperate with corporates, custodians, brokerages, e-commerce sites, publishers, rating agencies, exchanges, regulators, anchors and institutional investors. This would be important in creating awareness of their various initiatives and even help in identifying prospective players ideal for the launching of business ideas.

Engineering designs are normally required in the processes of developing new products. A study by Pearson *et al.,* (2015) claims that this entails back-testing, screening and equity analysis for the sake of identifying ideas worth investing in them. This process may entail feasibility studies as well as conducting cost benefit analysis to determine the viability of new products, understand their markets, pool opportunities and determining the arithmetic base behind product's number. Accordingly, the market analysis should identify participants in the industry across various countries and target markets where products would be sold. The process of identifying alternative routes for launching such products, mechanisms that would be used to counter possible resistance, capacity building and developing training models would also be important in this process. Most of engineering related projects tend to be long-term.

Engineering consultants would be critical in developing engineering designs. This may involve outsourcing their services through external agencies. In the absence of these people, the success of engineering related projects would be hampered greatly. This applies to projects conducted at regional level and even those in extended regions. Because most of economic linkages between countries that partner in such ventures are still low, individual companies can make effort to explore opportunities in different countries (UNDP, 2012).

2.10 Theoretical Framework

Overall, the study sought to evaluate the rural electrification expansion strategies, project control systems and implementation of energy access projects. Singleton 1988 claims that studies should be grounded on theory. The Oxford English dictionary defines theory as the idea utilized to account or justify a course of action or a situation. Accordingly, it may be regarded as system of ideas that explain things particularly on the basis of general principles that are independent of things under investigation.

2.10.1 Stakeholder Theory

This theory was developed for the first time by Dr. Edward Freeman who was a university professor. The theory was developed in 1983, but published in 1984 in a book titled, Strategic Management: A Stakeholder Approach. The theory suggested that stakeholders were many in any organization. It claimed that they included the people who invested in the company, the ones affected by its business activities, the company itself, its employees, the environmentalists within the environs of the company, the vendors as well as government agencies among other parties. The theory as developed by Freeman suggested that the success of companies thereby depended on the extent to which the needs of all those stakeholders were satisfied. This extended beyond the people who benefitted directly from the company. In this respect, the theory might be regarded as a specific approach that recognizes and deals with various groups of stakeholders. As a result, the way most of companies' approach stakeholder engagement, their organizational missions and visions, the techniques and tools they use to engage stakeholders, and their business practices are built around the way companies view the various groups of stakeholders (Kirsi, 2010). The theory is based on notion that organizations relate with various groups of people and institutions; as such, they maintain or engender their support by balancing their interests.

Kirsi (2010) further argues that the fact that the theory is built on premise that organizations relate with many constituent groups that affect or affected by their decisions imply that the theory is also concerned about those relationships. This relates to the outcomes and processes of the firms and their stakeholders; hence, the interests of all groups of stakeholders have intrinsic value implying that no single set of interests should dominate the others. In this respect, the theory is concerned about the decisions that those in management teams make. On this basis, an organization that bases its decisions on this theoretical approach may increase its performance from an economic viewpoint (Hasan and Kami, 2010).

Even though the theory is criticized by Blattberg (2004) by presuming that the interests of multiple stakeholders may be compromised or even balanced against each other for the sake of promoting certain interests, the researcher does not propose an alternative way of dealing with this challenge except acknowledging that dialogues may be utilized to address possible conflicts of interests. In the midst of this challenge, Kirsi (2010) observes that the theory is applicable to several fields even though it originated from strategic management. It is also applied in different ways and under different methodologies, criterion of evaluation, different types of evidences and concepts. Thus, it is against these approaches that this theory supports project fund mobilization and project control mechanisms strategies.

2.10.2 Theory of Constraints

The theory started as a scheduling aid for production and it was developed by Dr. Eliyahu Goldratt back in the 1970s. Back then, it was termed as a time table for optimizing productions; hence, it was adopted into developing a software package referred to as optimized production technology. About a decade later, Goldratt with the help of other people led people into believing that they needed to change their ways of doing things as opposed to tailoring computer programs for automating their old ways of thinking and doing things. This was in relation to the failures experienced under the turnkey package (Davis and Mabin, 2009). Accordingly, Togar and Ramaswami, (2004) suggested that Theory of Constraints aimed at initiating and implementing breakthrough improvements by focusing its attention to constraints that hindered higher performance levels. Accordingly, the theory observes that firms should have at least one constraint that needs to be addressed to optimize outputs.

Goldratt and Cox define constraint as every factor or element that hinders systems from performing their duties as they are designed to perform them. That is, it hiders systems from attaining their goals.

Constraints may be classified into four groups. The first group relates to political constraints, which relate to scopes of projects, their visions and missions. The second one relates to technical constraints that relate to technologies, climate, landscape, geological conditions, existing infrastructures and competencies. The third one relate to social constraints, which relate to personal relationships, organizational hierarchies, expected behaviors and codes of conduct. The fourth one relates to administrative constraints, which include project scopes, schedules, contractual agreements and budgets (Sebastiano and Ragnhild, 2014). This theory challenges those in management teams to rethink the way they approach organizational goals, the things they consider to be productive actions and the purposes of cost management. Therefore, it is against these challenges that this theory supports project planning and project company strategies.

2.10.3 Ladder of Participation Theory

Ladder of participation theory was originally developed and published by Arnstein, Sherry R.in 1969. Sherry Arnstein, writing in 1969 about citizen involvement in planning processes in the United States, described a ladder of citizen participation that showed participation ranging from high to low. Arnstein, (1969) detailed that the theory of ladder of participation explains the different levels of participation at community level from manipulation or therapy level of citizens, consultation level and to what is viewed as the genuine participation level like partnership and citizen control. One of the aims of access to energy is empower locals by giving them an opportunity to take part in decision making on projects to be implemented in their area. There are vital reasons for associating participation with community development as an approach to community participation. The aim to meet basic needs obviously requires the participation of all who benefit from the project. Participation in implementation of a program improves effectiveness and efficiency through mobilization of local resources and the development of the capacity of the community to plan and implement which requires greater intensity and scope of participation as the projects proceeds. It is therefore important to note

that the theory emphasizes the importance of beneficiaries' involvement in project cycle hence the need to use this theory as a relevant for this work (Sadiullah, 2009). Therefore, it is against this aims that this theory supports project service outsourcing and combined rural electrification expansion strategies.

2.11 Conceptual Framework

Conceptual framework is a written or virtual product explaining either in narrative or in graphical form the elements under investigation. Explicitly, the study sought to examine rural electrification expansion strategies, project control mechanisms and implementation of energy access projects as shown in Figure 1.

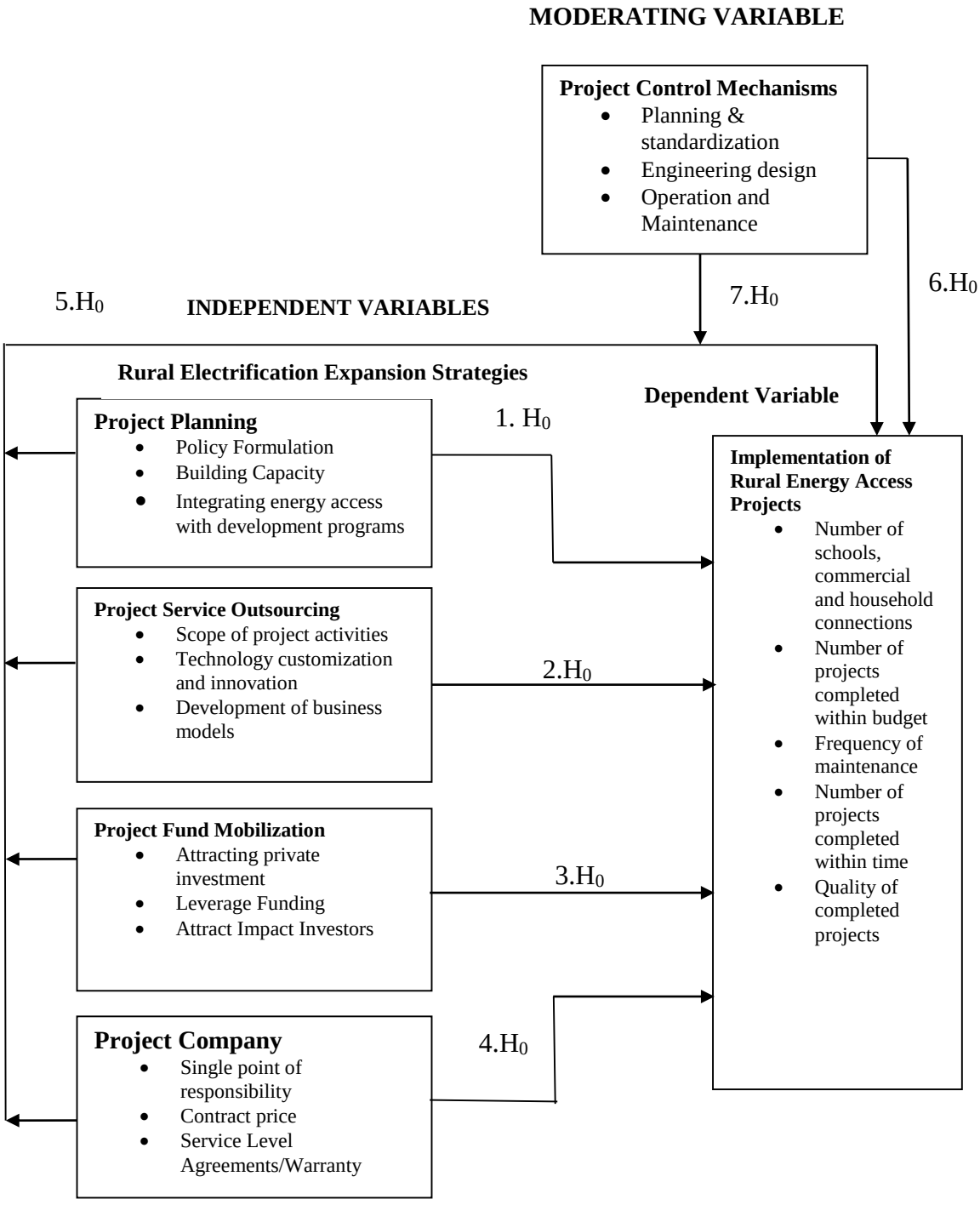

Figure 1: Conceptual Framework for Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

In establishing an enabling policy environment, key elements to attracting private sector in energy access are identified. These include flexible regulatory and business processes, transparency, policy stability and access to clean energy. Governments create enabling environments by developing the requisite policies, building capacity within public sector and leveraging resources among development programs as a way of fostering robust markets and attracting finance from external sources. Nonetheless, even in the presence of enabling policies, it is possible for energy access projects to encounter hurdles. In some instances, the projects may be too small; risk perceptions might be too high whereas returns might be little for conventional financing options to drive market on their own. To attract private sector into energy access following key elements of catalyzing finance are identified: these include access to credit market for all market players, engaging financial institutions into all market programs and developing targeted incentives as well as developing financial mechanisms that support markets rather than distort them.

When energy access from off-grid is approached on the basis of each project without promoting domestic capacity that support the market, there is a likelihood that projects are not supported in the long run to be sustainable. Building human capacity enables programs to be developed in a way that support viable businesses, engage market in full spectrum and engage all skilled workers available in a market; thus attracting private sectors into energy access projects. Integrating energy access to development programs entails using energy access projects to support social services such as those related to health and education to improve the quality of lives of local people. Access to energy has the ability to improve a range of government led projects; as a result, it is possible for government to leverage resources from its various ministries to enhance the process of supplying energy to various parts of the country. Such networks from various ministries create more market for energy and even nurturing other markets. Thus, the key elements to attracting private sector under this variable are those that support fundamental social services with a view to increasing the base rate of viable customers, integrating energy access market with developmental programs and coordinating energy markets as well as making sure that markets are not distorted.

2.12 Summary of Literature Review and Knowledge Gaps

The chapter has covered two main areas. First, it has presented a discussion regarding empirical research literature, with emphasis on strategies adopted in implementation of energy access projects. Several factors have been identified and discussed and include technological, institutional and financial aspects Secondly it has defined and looked at the theories that explain rural electrification expansion strategies. This gives a good basis for the current study because it provides the background information on the Implementation of access to energy projects. However, there are gaps that exist in understanding the extent to which rural electrification expansion strategies influences the decision to implement energy access projects.

The theories anchored to this study include stakeholder theory, theory of constraints and ladder of participation theory. Stakeholder theory is important for the study because Projects are linked to a variety of stakeholders who influence or are influenced by the execution of those projects hence there is need to maintain support and balance their interests (Kirsi, 2010). Theory of constraints was adopted because it focuses on initiating and implementing breakthrough improvements by addressing itself to constraints that hinder higher levels of implementation and performance considering that every project can have at least one constraint (Togar *et al.*,2004). Ladder of participation theory was adopted since it emphasizes the importance of all players' involvement in the project cycle. The aspect of community involvement enhances projects' efficiency by mobilizing local resources and promoting capacity among local people. Accordingly, community involvement is an essential aspect in every project especially as it proceeds on (Sadiullah, 2009).

Strategy implementation in organizations in the power industry has in general not received much attention and hence significant gaps exist in our knowledge. In this respect, there is need for more researches to be conducted to fill the gap. Hence the study is designed to fill this gap by emphasizing on the influence of rural electrification expansion strategies on implementation of energy access projects.

Table 2.1 Summary of Research Gaps

Author/Year	Focus of the Study	Methodology	Findings	Knowledge Gaps	Focus of the Current Study
Project Planning and Implementation of Energy Access Project					
Tomas, T., & Sanchez, T. (2013).	The study examined the influence of economic poverty and lack of political will on electricity access	The study explored the influence of economic poverty and lack of political will on the electricity access	Results showed that economic poverty and lack of political will as two important factors influencing the electricity access to rural households.	The study findings were adequate however they needed to explore the role of Project planning strategy increating frameworks that support energy access which remains a key challenge to energy access	The studythereforefocused on the influence of project planningstrategy on the implementation of rural energy access projects in underserved counties in Kenya
Pham, K.T., Nguyen, M. B., & Nguyen, H.D., (2011).	The study looked at electricity and business policies for centralized grid	The study explored electricity and business regulations for centralized grid	Results showed to enable wider range of electricity projects to expand access to energy, regulations should be reviewed to ensure they allow flexibility in the types of technology, type of projects and business models	The study emphasized on central grid and ignored off grid electricity projects which often hinder or stop implementation of energy access in rural households	The study focused on the influence of project planning strategy on Implementation of energy access projects in underserved counties in Kenya
Project Service Outsourcing and Implementation of Energy Access Projects					
Mills, (2014)	The purpose was to determine the most effective model for providing energy services to local consumers in a replicable and reliable model	The study explored the ways of developing effective modes for providing energy services to local consumers	Results revealed that reliable business models can create local distribution channels and support services in energy sector which further creates local ownership and jobs and economic development in areas they serve	The study findings were key and covered models that could foster energy access markets, but different markets have different challenges	The role of project outsourcing strategy in the implementation of energy access projects in underserved counties in Kenya was studied

Project Fund Mobilization and Implementation of Energy Access Projects

Tomas, T., & Sanchez, T. (2013).	Financing electricity access to the poor	The study explored way of financing electricity access to the poor	Findings revealed that funding institutions have a key role to play in financing electricity access to the poor and concentrated on commercialization of SHS and Implementation of small energy generation projects	The study did not take into consideration the minimum energy needs of the poor and ignored the issue of equity and justice which can only be achieved if basic needs of the poor household are covered	Focus of the current study was to examine the influence of project fund mobilization on the implementation of energy access projects in underserved counties in Kenya
Zhang & Kumar (2011)	Purpose was to identify primary factors affecting rural electrification	The study explored the primary factors affecting rural electrification	The study established that lack of funds and proper education as the primary factors affecting rural electrification	Despite funding and education, their studies failed to show how these factors link with other factors such as the willingness of people to pay by the rural population	The study focused on the extent to which project fund mobilization influences implementation of energy access projects in underserved counties in Kenya

Project Company and Implementation of Energy Access Projects

Gloria T., William E., Siegfriedt W. E., Carstens A., (2011).	Delivery of electricity services and provision of reliable services to the rural household	The study explored ways in which a contractor will deliver a project for a guaranteed price by a guaranteed date and perform to a specified level	Findings indicated that in order to improve implementation of energy projects, the project company should focus on construction time, reduced delays, maintain stable workforce and establish partnerships with contractors	The study considered the aspect of time, cost and quality but ignored the aspect of risk and contract management which if not implemented and controlled may have negative impact on the whole project; delayed schedule, cost overruns, quality and safety	The influence of project company strategy on the implementation of energy access projects in underserved counties in Kenya was studied

Combined Rural electrification expansion strategies and the implementation of rural energy access projects

Desjardins, S., Richard G, Pradeep P, & Chris W., (2014).	The study was to establish the strategies and ideological foundation to which the combined efforts various players in the energy sector	The study established rural electrification strategy and implementation plan aimed at achieving rural electrification targets	Findings were that there is need to have a strategy and framework that unites all the major players in the energy sector and recommended that the poor can afford and maintain sustainable technologies and that social enterprise such as rural electrification can be run as commercial businesses	The study did not establish a project model that ensures sense of ownership by combined players. The studydid not establish the influence of combined rural electrification expansion strategies on implementation of energy access projects	Focus of the current study was to ascertain the extent to which combined rural electrification expansion strategies influences the implementation of energy access projects in underserved counties in Kenya

Project Control Mechanisms and Implementation of Energy Access Projects

Martinsuo and Killen, (2014)	The aim of the study was to identify project control mechanisms that help monitor and supervise project implementation to ensure compliance with standards	The study established that project control mechanisms requires minimum requirements to be able to have an influence on implementation of projects	Findings were that rural electrification projects require a framework that meets minimum safety and technical standards, quality and appropriate design to have a positive influence on implementation of projects	Despite identifying minimum standards to be met by project control mechanisms the study did not go further into assessing relationship of planning and operation and maintenance on the implementation of those projects	The study focused on the influence of project control mechanisms on the implementation of energy access projects in underserved counties in Kenya

Combined Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

Florence and Wan, (2013)	The aim of the study was to identify control mechanisms that give rise to better performance of projects implementation	The study established that project control mechanisms requires integration with the organizational strategies and methodology	Findings were that there is need to have an integration between organizational strategies and methodologies that give rise to better implementation of projects	Despite identifying a relationship between project control mechanisms and strategies, the study did not go further into assessing relationship on the implementation of those projects	The study focused on the influence of project control mechanisms on the relationship between combined rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter contains the research methodology aspects that were utilized to conduct the study. These include the research design and paradigm, the target population from which the sample was selected from, the procedures utilized to collect and analyze the data, the ethical measures observed throughout the study process and the manner in which the variables were operationalized. The chapter also describes the validity and reliability of the research instruments that were used in the study.

3.2 Research Paradigm

A research paradigm directs and help articulate theories of already established as well as choice of research design, methods of data collection and analysis as well as data interpretation of research finding (Mertens, 2005). The Philosophical direction of this study is pragmatism because the nature of rural electrification expansion strategies being undertaken in the area are diverse with different purposes that need different control mechanisms. All of them have community contribution aspect which makes them rather dynamic. This dynamism could easily be accommodated by pragmatism which offers bases for use of different tools such as interview, questionnaire, document analysis, focus group discussions and observation in data collection.

Pragmatism paradigm fits closely with this study as it allowed the researcher to gather evidence from a wide range of sources and to critically evaluate them in terms of their strengths, limitations, and applicability to the practice setting (Plath 2013). It also assisted the researcher to focus their attention on essential concerns in active practice situations. Pragmatism paradigm suits best this study because the study aims to solve a problem related to energy access in the country. The pragmatism paradigm accommodates both the positivist and the constructivist philosophies (Morgan, 2007). The positivists do not acknowledge the integration of views from others and recommend that inferential statistics should be utilized to test hypothesis in the interpretation of the statistical results about the original. The constructivist paradigm, on the

other hand, relies on views of respondents about an issue under investigation. Thus, the use of a mixture of both the positivist and constructivist approaches led to the choice of pragmatism paradigm. Paradigm is a set of beliefs or philosophical presumptions that guide researchers when conducting a study (Creswell, 2012). A paradigm refers to how people view the world taking into consideration their beliefs. The current study conceptualized research paradigm on the basis of Morgan (2007) who defines paradigm as belief systems that influence the way researchers select research questions and methods utilized to evaluate those questions.

The current study was based on pragmatism paradigm because it allowed for the possibility of choosing the appropriate research methods from the wide range of qualitative and/or quantitative methods, and these mixed methods provides a broad understanding of complex phenomenon that would not be understood in any other single approach (Creswell and Plano, 2011) and thus this pluralism is a strength of pragmatism that has several advantages for social science research. It sets an inclusive framework of inquiry that supports interdisciplinary and cooperative research about the study (Pappas, 2017). For instance, possibility for generalization of findings due to wide and representative sampling within marginalized populations; analysis of cause-and-effect relationships among societies under study; creation of theory on the oppressive conditions facing marginalized groups and verification of it by confirming or disconfirming hypotheses generated from existing theories relevant to the study; increased depth and confidence in interpretation of findings related to oppressive conditions; reinforcement of small sample, in-depth interview or observation findings by documenting the representativeness' of oppressive conditions in larger representative samples based on Dewey's five-step model (Koenig, Terry, Rick, Spano and John Thompson 2019).

3.2.1 Research Design

The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring you will effectively address the research problem. A research design consists of the blue print followed in the measurement, analysis and collection of the data (Kothari, 2009). The design applied in the current study comprised of descriptive research design which involved analyzing data obtained at a single point in time (Orodho, 2003). In descriptive research design, a sample of the

population or the entire population is included in the study and the various variables are measured using a single questionnaire (Bhattacherjee, 2012).

The design choice was appropriate because a questionnaire was utilized to collect the data and examine the various rural electrification expansion strategies and the extent to which they influenced the implementation of access to energy projects. Mugenda and Mugenda, (2013) asserts that the design enables researchers to gather information with precision that is critical in testing hypotheses in the right way.

Correlational research design is one that measures two or more factors to estimate the degree to which they relate or do not relate to each other in a pattern that can be identified (Creswell, 2012). Since the current study is on the influence of project control mechanisms on the relationship between rural electrification expansion strategies and implementation of the energy access projects, then both correlational and descriptive research design were utilized. The descriptive one described the phenomenon of interest whereas the correlational one explained the link between various variables using simple and multiple regression models. Accordingly, the research design was also mixed in a way because both qualitative and quantitative approaches were utilized to collect and analyze the data whereas observation, interview guide and questionnaires were utilized to collect that data.

3.3 Target Population

The research had a total of 5,604 residents as shown in Table 3.1 out of whom a sample was selected. By definition, target population refers to the complete set of events, individuals or objects with common characteristic that a researcher intends to evaluate and generalize findings on them (Mugenda and Mugenda, 2013). Accordingly, it may be regarded as the larger group from which a sample is taken (Orodho, (2003). In line with this, the target population comprised of the different stakeholders involved in the execution of energy access projects. The unit of analysis was households, commercial centers, schools, hospitals and project managers of the key organizations involved in rural energy access sector projects. The projects were in 14 counties under equalization fund and spread out in the 14 counties in underserved counties in Kenya. These underserved counties are West Pokot, Turkana, Marsabit, Samburu,

Isiolo, Mandera, Wajir, Garissa, Tana River, Lamu, Kilifi, Kwale, Taita Taveta and Narok. The target population was 5,604 respondents(REA.,2016) drawn from the six service territories based on county allocations derived from scale of challenge (un-electrified population and community facilities), poverty index and population density to achieve greatest impact with limited resources, deliver services where the need is the largest, consider additional costs due to low population density and consider principles of equity such that all counties should benefit in a similar manner (Republic of Kenya, 2017). Such a division allows economies of scale in procurement and elicits private sector contractors to be present in these undeserved counties over a long term.

3.4 Sample Size and Sampling Procedures

This part of the study describes the sampling procedures and sample size used in conducting the study. A sample size is the number of items or people included in a study to form the sample whereas the sampling procedures relate to techniques utilized to select the items of that sample (Kothari, 2010).

3.4.1 Sample Size

The sampling frames are the lists of members who form the target population (Saunders and Lewis 2012). The Slovin's formula was utilized to determine the sample size. A 0.05 margin of error was utilized throughout the analysis (Almeda and Sarte, 2010).

$$\text{Sample size(n)} = \frac{N}{(1+Ne^2)}$$

Where:

n = Number of samples

N = Population size

e = Margin of error/ error margin

Calculating the sample size gives;

$$n = \frac{5,604}{(1+5,604 \times 0.05^2)}$$

$$= 373$$

Hence, the study's sample was 373 respondents as the formula determined. The allocation of a sample into the strata was done using Neyman allocation formula. The formula was utilized to maximize the precision of the sample from the calculated sample size, (Neyman, 1934). With Neyman allocation, the number of respondents from each stratum was as Table 3.1 shows.

Table 3.1: Sample Size Calculation for the Study

County	Lot Number	Number of Projects	Target Population	Number of Respondents Sampled per Lot $n_h = \left(\frac{N_h}{N}\right) x\ n =$ (1380/5,604) * 373 = 92
West Pokot Turkana Marsabit	1	6	1,380	92
Samburu Isiolo	2	3	660	44
Mandera Wajir Garissa	3	6	1,074	71
Tana River Lamu	4	4	880	59
Kilifi Kwale	5	3	690	46
Taita Taveta Narok	6	4	920	61
Total		**26**	**5,604**	**373**

Source: REA Electrification Baseline Information, (2016)

3.4.2 Sampling Procedures

The procedure of how the 373 respondents were selected out of the total population of 5,604 is as summarized in Table 3.1. Sampling is a selection process that aims to acquire a representative sample from target population. The sampling design represents the framework within which sampling takes place, but a sample should be representative (Bless and Higson, 1995). The study's sample size was 373 respondents. To collect sufficient data, sampling frame was put into clusters and cluster sampling used to cluster the regions and simple random sampling utilized to pick respondents as shown in Table 3.1. The purposive sampling, on the other hand, was utilized to pick key informants who included project team leaders from the four participating energy players. Accordingly, four key project team leaders from the four energy sectors

in the study and six project site agents/engineers were selected purposively to take part in in-depth interviews whereas simple random sampling was utilized to pick respondents from the strata who were given questionnaires to complete.

3.5 Research Instruments

Data for this study was obtained through questionnaires, interview guide and observation guide. These were the right ones because realities around rural electrification strategies and implementation of energy access projects needed to be evaluated both objectively and subjectively (Creswell and Plano, 2011). Both quantitative and qualitative approaches were utilized in the study because the method was mixed. Data collection is a means by which information is obtained from the selected subject of an investigation (Mugenda and Mugenda, 2013). For this study data collected entailed all the responses on the study variables which included rural electrification expansion strategies, project control mechanisms and implementation of energy access projects. Data obtained from the questionnaires was triangulated with the data from the interview guides and the observation guide. The use of various data collection was in tandem with the pragmatism paradigm which allowed the use of various tools. Both primary and secondary data was collected during the research. The questionnaire contained both structured and unstructured questions. The open-ended questions were used to limit the respondents to given variables in which the researcher is interested while unstructured questions were used in order to give the respondents room to express their views in a more pragmatic manner (Kothari, 2009). Secondary data was gathered from existing credible and recognized sources. The data comprised of materials that were desirable, current, accurate, sufficient and relevant collected from library text books, internet and magazines and personnel file in the organization.

3.5.1 Questionnaire for Residents

The questionnaire utilized to collect data from respondents was largely structured. By definition, a questionnaire is an instrument that comprises of research questions intended to obtain information from research participants in a standardized manner (Bhattacherje, 2012). A questionnaire was preferred over other instruments because the study focused much of its attention on quantitative information. In addition, it was preferred because it offered the

respondents a chance to provide information relating to rural electrification expansion strategies, project control mechanisms and implementation of energy access projects, an area in which consumers in energy sector would actively take part. The data was collected between 30th November 2018 and 12th April 2019. The questionnaire is as shown in Appendix II.

The questionnaire had seven sections; the first one collected the respondents' demographic information. It was intended to obtain their background information. The second one obtained information relating to the implementation of energy access projects whereas the third one obtained information relating to project control mechanisms. The others (4th, 5th, 6th and 7th) addressed themselves to issues relating to the influence of project planning, project service outsourcing, project fund mobilization and project company strategies on the implementation of energy access projects.

3.5.2 Interview Guide for Project Team Leaders and Site Agents

Normally, interviews are generally more personalized ways of collecting data than questionnaires and they are normally carried out by interviewers with some form of training. This is irrespective of the fact that the set of questions posed to respondents are normally similar to those utilized in questionnaires. During the interviews, the interviewers have the opportunity of clarifying issues of concern to respondents than in the case of questionnaire that depends on the way respondents understand research questions (Bhattacherjee, 2012). Appendix III provides the interview guide utilized to collect qualitative data from the people who were considered key informants. These people included the project team leaders as well as site agents who supervised projects. As the interview guide shows, the questionnaires were open-ended to allow them to express their views adequately. Most of the interviews held at site offices of the project team leaders and site agents lasted at least 20 - 25 minutes and were done during the period of 29th November 2018 to 12th April 2019. Information on rural electrification expansion strategies, project control mechanisms and implementation of energy access projects was collected. The interviewee had the opportunity to clarify their responses during the interview processes.

3.5.3 Observation Guide

An observation guide was also used to collect data. Much was learnt by observing human behavior and enable deeper understanding of relationships among various groups and individuals. During observation the researcher was able to pay attention to non-verbal cues that facilitated better understanding of respondent's behavior (Gebremedhin *et al*., 2010). With the help of this method, the researcher was able to cross-check the non-verbal expressions of the respondents and even scrutinize events within their sites. He was also able to cross check the responses provided in questionnaires with those provided during interviews (Kawulich, 2005). Among the areas observed included activities taking place on site, workmanship of the implementing partners, quality of products used during implementation at the site and interaction of the stakeholders. A detailed process that was followed through observation is in Appendix IV.

3.5.4 Pilot Testing of Research Instruments

According to Kothari and Garg (2014), a pilot study is a small study conducted prior to a large piece of research to determine whether the methodology, sampling, instruments and analysis are adequate and appropriate. The objective of pre-testing the data collection instrument was to evaluate particular facets of research to establish if the chosen procedural directives were functioning as planned. Accordingly, the pilot testing focused much of its attention on evaluating the validity and reliability of the instruments. Besides, a pre-test can help identify the short comings that could be experienced during the actual study and hence, put in place corrective measures. According to (Orodho, 2003), it evaluates the reliability of an instrument. Cooper and Schindler (2006) claim that instrument's reliability determines whether an instrument measures what it is intended to measure, which extends to the truthfulness of the results. In this respect, pilot testing helps in detecting weaknesses in the design of an instrument to ensure that it provides truthful results (Young, 2009), was used in determining if the instruments were able to measure and determine if the respondents easily respond to questions. Testing of research instrument on a pilot sample was undertaken to assess the lucidity and accuracy of the questions in the instruments before conducting the research. Connelly (2008) suggests that a pilot study should include about 10 percent of the sample size. Therefore, during

piloting, draft questionnaires were distributed to 37 respondents in Narok County, who were then excluded in the final data collection. This constituted 10% of the sample targeted.

A pilot test was conducted on two REA-funded projects in Narok County. The Narok County was purposely selected because it was near to Nairobi where the researcher resided, hence, it was possible for him to carry out the study within budget limits. The people who took part in the pilot study were not included in the main study. The pilot study questionnaires were furnished to the respondents by self-administering or research assistants where applicable and reliable. The Cronbach alpha technique was utilized to analyze the data obtained from pilot study and the data further used to improve and adjust the questionnaire to ensure internal consistency of the questionnaires was established. The following elements were considered in improving the questionnaire, comprehension, relevance, and interpretability in the view of study's objectives. At last, all the aspects of reliability were approved.

3.5.5 Validity of Research Instruments

There are various categories of validity and these include construct, criterion and content. This relates to the extent to which instruments evaluate what they are intended to evaluate in a study. The content validity relates to the extent to which an instrument adequately covers an area of study under investigation (Kothari, 2010). Construct validity, on the other hand, evaluates the extent to which an instrument's outcomes conform to pre-determined correlation with theoretical ones. Lastly, the criterion one relates to the manner in which an instrument predicts the outcomes of a current condition (Kothari, 2010). In the current study, construct validity was used to check how the questions were phrased to ensure that they conveyed the intended meaning. In general, validity relates to the meaningfulness of inferences made based on the outcomes of a study. Intensive literature review was partly utilized to attain a high level of validity. This related to adaptation and modification of the already tested instruments to fit the study and the advices obtained from field experts who included supervisors, practitioners, and academicians from the university. This ensured that the questionnaire was focused so that it could collect accurate data consistent with study's objectives. The supervisors assessed the conceptual framework and questionnaire contents guided by the specific objectives which was approved.

Validity of the interview guide was ensured though careful record keeping through voice recording during interviews and note taking. Further the respondent validation was used whereby interviewees were invited to check and comment on the manuscripts. Peer briefing using my supervisors and qualified colleagues in this field was used in assessing the authenticity of the data in terms of the way final themes and concepts created adequately reflected the phenomena under study. Observation research instrument was carried out by research assistant and the researcher. This way the validity of the instrument was enhanced since data obtained from each was compared and biases minimized.

3.5.6 Reliability of Research Instruments

The Cronbach's alpha measured the reliability of the data collection instrument. This tool helps in assessing the internal consistency of the variables. The reliability of the instrument was concerned about the consistency of the results obtained from the instrument over time. If the results of an instrument and study can be reproached for a second or a third time or even more, then an instrument is regarded to be reliable (Orodho, 2003). Therefore, the reason behind the pilot testing was intended to evaluate the clarity of research questions to ensure that other respondents would respond to those questions in almost similar way as the initial ones did. The statements that were found to be vague were thereby modified to clarify them for the sake of improving the instruments' reliability. Once again, a pilot sample from Narok County was utilized to evaluate the instruments' reliability. The Cronbach's alpha was then determined with a value of 0.6 acting as the least acceptable one (Hair and Tatham, 2006).

Normally, the adequate values of Cronbach alpha range between 0.70 and 1(Bland and Altman, 1997), but the current study was able to attain a value of 0.872, which represented the reliability statistics for all the variables and Appendix VI present's reliability statistics for all individual variables in the study. The reliability statistic of 0.872 implies that the indicators used in this study were all reliable. Table 3.2 depicts that implementation of energy access projects has the largest alpha of 0.872, followed by project implementation company at 0.87, then project fund mobilization at 0.864, followed by both project planning and project service which had 0.863 and finally project control mechanism which had 0.862. All the reliabilities were high; thus, it

was determined that internal consistent reliability measures were adequate implying that they were adequately measured and good for further analysis.

Table 3.2: Reliability of the Dependent and Independent Variables

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Implementation of Energy Access Projects	376.894	875.171	0.405	0.872
Project Control Mechanisms	373.3543	777.512	0.714	0.862
Project Planning	372.1589	834.779	0.639	0.863
Project Service Outsourcing	370.3874	811.295	0.664	0.863
Project Fund Mobilization	372.3146	855.113	0.615	0.864
Project Implementing Company	369.702	846.682	0.496	0.87

The results in Table 3.2 were gathered from pilot study's data. Hence, the instruments were modified in the light of these findings. This ensured that the instruments were reliable and valid.

3.6 Data Collection Procedures

This relates to the way data is obtained from relevant people included in a study (Mugenda and Mugenda, 2013). To ensure that the data was collected in the right way, an introduction letter was obtained from the University and permission was obtained from NACOSTI. This ensured total adherence to ethical issues in research. Subsequently, approvals were sought from the Council of Governors, REA headquarters and from Energy access companies. The contact details of relevant project site personnel and resident managers were obtained from various players. Questionnaires were used in gathering qualitative and quantitative data. The process was largely self-administered meaning that the respondents filled the questionnaires on their own. The researcher used a drop and pick approach to have the questionnaire filled. The researcher personally administered the questionnaires to the respondent's residents to ensure the right data was collected on time. Therefore, the respondents had a chance to clarify their queries on the spot and the researcher had an opportunity to motivate respondents to respond to questions. The interview dates were pre-arranged, and interview guides were used. The follow up process was conducted using calls and emails to book appointments to seek permission from respondents who took part on the interviews. The researcher engaged research

assistants whereby some were residents of the underserved counties. The questionnaires were collected back for analysis with the assistance of the research assistants who before engaging in that process were inducted on various ethical issues, data recording process and relevant interview skills. Each of the research assistants was issued with an introductory letter that authorized him/her to collect questionnaires on behalf of researcher.

3.7 Data Analysis Techniques

This process relates to techniques utilized to transform data into useable form so that relevant trends and insights can be obtained from raw data for the sake of making decisions and drawing inferences (Sharma (2005). It entails evaluating data obtained from field for the sake of making final decision. In the current study, the findings were discussed and presented in line with study's objectives.

This study produced both quantitative and qualitative data with a view to elaborating the influence of rural electrification expansion strategies exhaustively. Once data collection activity was over, the researcher edited and also tackled the issue of blank responses, coded, categorized and keyed in the data into SPSS program for actual analysis to be done. This exercise was done to check for completeness of the data collected via questionnaire. The data was then evaluated to determine whether it came from normal distribution or not using the Normality test. This entailed using the Kolmogorov- Smirnov test statistics (KS-test), Shapiro-Wilk test, significance tests and various forms of plots. The Multicollinearity test was done using Variance of Inflation factor (VIF) whose values ranged between 1 and 4. According to Marquardt (1970), the VIF values that exceed 10 suggest high level of multicollinearity. The current study therefore did not experience high levels of multicollinearity given its values ranged between 1 and 4. To ensure validity of the models developed in this study, multiple regression assumption tests were performed which included the normality and multicollinearity. Correlation analysis was also undertaken. Data analysis techniques employed were simple and multiple regression which resulted to useful information.

The researcher further performed descriptive analysis to measure central and dispersion tendencies of variables using mean, standard deviation and percentages. Study variables were

also tested through inferential analysis which was utilized to test the hypotheses for the sake of generalizing the study's findings to the target population. The F-test was carried out to test the best of fit. R^2 which refers to coefficient of multiple determinations was also used to show how successful the best of fit was in explaining data variation. In addition to the R^2 test, the test of the slope using t statistic was performed to assess the significance level of the individual regression coefficient of each study variable.

Version 23 of Statistical Package for Social Sciences (SPSS) program was utilized to analyze the data and generate the various types of statistics. The 0.05 was the level of significance that was utilized throughout the study implying that the confidence level used in the study was 95 percent. The measures of central tendency were applied to finite data. This was intended to ensure that the data was normally distributed along the mean values. Accordingly, the standard deviation values were utilized to check the strength of that tendency. The qualitative data was analyzed separately by way of identifying themes and patterns from the responses that the respondents provided. The identification of themes was intended to identify the link between various variables. Accordingly, transcripts were utilized to identify themes and classify them together (Burnard and Chadwick, 2008).

Data triangulation was done so as to strengthen the data's validity and reliability. Data was therefore collected from different participants and different sites of the setting. Data obtained was therefore cross-checked for consistency of specific and factual data statements recorded in the data collection instruments. In the current study, data was analyzed through comparison of qualitative data received from structured questionnaires for residents with qualitative in-depth interviews for site engineers and observation guide by the researcher. Further data obtained from the structured questionnaire was analyzed both descriptively and inferentially. The results were then corroborated with those from the structured in-depth interviews and observation guide.

To further analyze the data, the Pearson's Product Moment correlation coefficient(r) and multiple linear regression models were utilized to analyze the influence of various variables. The (r) test evaluated the strength of relationship between various variables. A two-tailed test

was utilized to for the level of significance of those relationships because it was presumed that the link would be in either direction. The multiple regression analysis evaluated the influence of combined rural electrification expansion strategies on the implementation of energy access projects. The hypotheses with linear relationship were analyzed using simple regression analysis in conjunction with (r). The descriptive statistics in conjunction with simple graphics formed the basis of quantitative data analysis (Kothari, 2009). The correlation analysis evaluated the link between various variables. The interpretation of this data was based on (r) that ranged between +0.10 and +0.29 represented weak correlation, +0.30 – +0.49 represented moderate correlation, whereas that between +0.50 and +1.0 represented a strong correlation (Shirley and Daniel,2005). That is, the empirical models were used to portray the connection between the study variables which ranged from correlation test using Pearson correlation coefficient and regression models to test for degree of significance of the association. The hypotheses were tested using the functional specification and simple linear regression analytical model as follows:

Functional specification: $y = f(Xi, \varepsilon_i)$ where Xi are the independent variables and ε_i is the error term and i = 1,2,3,4

Analytical model: $y = \beta_{oi} + \beta_i X_{i+} \varepsilon_i$ where β_{oi} is the constant of regression of y on X_i and β_i is the coefficient of Xi

1.$H_{0:}$ Project planning does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following simple linear regression model was utilized to test this hypothesis;

Implementation of energy access projects = f (Project planning strategy)

Functional specification $y = f(X_1, \boldsymbol{\varepsilon})$

Analytical model $y = \beta_o + \beta_1 X_{1+} \boldsymbol{\varepsilon}$ **.....** (i)

Where

Y = Implementation of rural energy access projects

X_1= Project planning

β_o = Constant term

β_1 = Beta Coefficient

$\boldsymbol{\varepsilon}$ = Error term

2.H_0: Project service outsourcing does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following model was utilized to test the second hypothesis.

Implementation of rural energy access projects = f (project service outsourcing)

$Y = f(X_2, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_2 X_2 + \boldsymbol{\varepsilon}$ **.....** (ii)

Where

Y = Implementation of rural energy access projects

X_2= Project service outsourcing

β_o = Constant term

β_2 = Beta Coefficient

ε = Error term

3.H_0: Project fund mobilization does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following model was utilized to test the third hypothesis;

Implementation of rural energy access projects = f (project fund mobilization)

$Y = f(X_3, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_3 X_3 + \boldsymbol{\varepsilon}$ **.....** (iii)

Where

Y = Implementation of rural energy access projects

X_3= Project fund mobilization

β_o = Constant term

β_3 = Beta Coefficient

ε = Error term

4.H_0: Project company does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following model was utilized to test the fourth hypothesis;

Implementation of rural energy access projects = f (Project Company)

$Y = f(X_4, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_4 X_4 + \boldsymbol{\varepsilon}$ **.....** (iv)

Where

Y = Implementation of rural energy access projects

X_4= Project Company

β_o = Constant term

β_4 = Beta Coefficient

ε = Error term

5.H_0: Combined rural electrification expansion does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The fifth hypothesis was non-linear and was tested using multiple regressions. The corresponding empirical model was as follows;

Implementation of Energy Access Projects = f (Project Planning, Project Service Outsourcing, Project Fund Mobilization, Project Company)

$Y = f (X_1, X_2, X_3, X_4, \varepsilon)$

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$**.....** (v)

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

β_0= Constant term

$\beta_1, \beta_2, \beta_3, \beta_4$ = Beta coefficients

ε = Error term

6.H_0: Project control mechanisms do not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following model was utilized to test the sixth hypothesis;

Implementation of rural energy access projects = f (project control mechanism)

$Y = f (X_6, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_6 X_{6+}$ **ε.....** (vi)

Where

Y = Implementation of rural energy access projects

X_6= Project service outsourcing

β_o = Constant term

β_6 = Beta Coefficient

ε = Error term

7.H_0: The strength of relationship between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in the country does not depend on project control mechanisms.

The seventh hypothesis was non-linear and was tested using multiple regression models. The corresponding empirical model was as follows;

Implementation of Energy Access Projects = f (Project Planning, Project Service Outsourcing, Project Fund Mobilization, Project Company, Project Control Mechanism)

$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_1 X_2 X_3 X_4 X_5 X_6 +$ **ε .....** (vii)

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

X_5= Project Control Mechanism

β_0= Constant term

$\beta_1,\beta_2,\beta_3,\beta_4,\beta_5$ = Beta coefficients

ε = Error term

3.7.1 Summary of Statistical Test of Hypotheses

The empirical analysis was tested based on study's objectives.

Table 3.3: Summary of Statistical Tests of Hypotheses

Objective	Hypothesis	Statistical Analysis	Model	Level of rejection/ acceptance
To determine the extent to which Project Planning influence implementation of rural energy access projects in Kenya	1.$H_{0:}$ Project planning does not influence the implementation of rural energy access projects in Kenya	Simple Linear regression	$Y = \beta_o + \beta_1 X_1 + \varepsilon$	Reject Ho if $p > 0.05$ Fail to reject H1 if $p < 0.05$ Strength of relationship for r values will be $-1 \leq r \leq +1$
To establish the extent to which project service outsourcing influence implementation of Rural energy access projects in Kenya	2.H_0: Project service outsourcing does not influence the implementation of rural energy access projects in Kenya	Simple Linear regression	$Y = \beta_o + \beta_2 X_2 + \varepsilon$	
To establish the extent to which Project fund mobilization influences the implementation of rural energy access projects in Kenya,	3.H_0: Project fund mobilization does not influence the implementation of rural energy access projects in Kenya	Simple Linear regression	$Y = \beta_o + \beta_3 X_3 + \varepsilon$	
To examine the extent to which project company influences the implementation of rural energy access projects in Kenya	4.H_0: Project company does not influence the implementation of rural energy access projects in Kenya	Simple Linear regression	$Y = \beta_o + \beta_4 X_4 + \varepsilon$	
To establish the extent to which combined Rural	5.H_0: Combined rural electrification expansion	Multiple regression	$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$	

electrification expansion strategies influences the implementation of rural energy access projects in Kenya	strategy does not influence the implementation of rural energy access projects in Kenya			Reject Ho if $p > 0.05$ Fail to reject H1 if $p < 0.05$ Strength of relationship for r values will be $-1 \leq r \leq +1$
To establish the extent to which project control mechanisms, influence the implementation of rural energy access projects in Kenya	6.H_0: Project control mechanisms does not influence the implementation of rural energy access projects in Kenya.	Simple Linear regression	$Y = \beta_o + \beta_6 X_{6+} \boldsymbol{\varepsilon}$	
To investigate the extent to which project control mechanisms influences the relationship between Rural electrification expansion strategies and the implementation of energy access projects in Kenya	7.H_0: The strength of the relationship between rural electrification expansion strategies and implementation of energy access projects in Kenya does not depend on the project control mechanisms	Multiple regression	$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_{5+} \beta_6 X_{6+} \beta_7 X_1 X_2 X_3 X_4 X_5 X_6 + \boldsymbol{\varepsilon}$	

3.8 Ethical Considerations

The researcher had social and professional obligation to ensure that the whole process of research adhered to ethical guidelines. Once approved by the relevant authority, that is, The University of Nairobi to collect data the researcher further sought permission from other external research affiliated bodies: NACOSTI, Council of Governors and Rural Electrification Authority to ensure that ethical considerations were strictly followed. In addition, a consent form was issued to every respondent explaining the benefits and risks of the study to them and the importance of them taking part in it and providing accurate information. Normally, ethical issues apply to all stages of study ranging from identification of respondents to dissemination of study's findings. These relate to issues related to the way respondents and data are accessed, the level of confidentiality applied to the study, the process applied to conceal the identities of the respondents, the consents that respondents give at any given time and anything else that might threaten the lives of respondents (Creswell *et al*., 2011).

Throughout the whole research process, the respondents were assured that the responses they provided would not be shared with anyone because they were private and confidential and were to be utilized purely for academic purposes only. In line with this, the researcher adhered to ethical practices including making sure that the identities of respondents were not disclosed to anyone and encouraging respondents to take part in the study on a voluntary basis. In addition, he analyzed and reported the data in an ethical manner without compromising it to fit pre-conceived outcomes or findings. The information was thereby utilized solely to fulfill the study's objectives.

3.9 Operationalization of Variables

This concerns itself with the way variables are defined in a study. This section highlights the manner in which the variables were operationalized. The dependent variable was implementation of energy access projects. The independent variables include; project planning, project service outsourcing, project fund mobilization and project company while the moderating variable was project control mechanisms. Table 3.4 shows the operationalization of variables used in the study

Table 3.4 Operationalization of Variables

Objectives	Variables	Indicators	Measurement	Levels of Measurement	Tools of Data Analysis	Type of Data Analysis
To examine the extent to which project planning influence implementation of rural energy access projects	Project Planning Independent Variable	• Policy Formulation • Building Capacity • Integrating Energy Access with Development Programs	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Interval • Ordinal	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis	• Descriptive analysis • Inferential analysis
To establish the extent to which project service outsourcing influence implementation of Rural energy access projects	Project service outsourcing Independent Variable	• Scope of Project activities • Technology customization and innovation • Development of business models	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Interval • Ordinal	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis	• Descriptive analysis • Inferential analysis

To establish the extent to which Project fund mobilization influence the implementation of rural energy access projects.	Project Fund Mobilization Independent Variable	• Attracting Private Investments • Leverage Funding • Attract Impact Investors	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Interval • Ordinal	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis	• Descriptive analysis • Inferential analysis
To examine the extent to which project company influence the implementation of rural energy access projects	Project Company Independent Variable	• Single Point of responsibility • Contract Price • Service Level Agreement	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Interval • Ordinal	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis	• Descriptive analysis • Inferential analysis
To establish the extent to which combined rural electrification expansion influence the implementation of rural energy access projects	Combined Rural Electrification Strategies Independent Variable	• Project Planning • Project Service Outsourcing • Project Fund Mobilization • Project Company	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Interval • Ordinal	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment	• Descriptive analysis • Inferential analysis

					correlation analysis • Multiple regression	
To establish the extent to which project control mechanisms influence the implementation of energy access projects	Project Control Mechanisms Independent Variable	• Planning and Coordination • Engineering Design • Operation and Maintenance	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Ordinal • Interval	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis	• Descriptive analysis • Inferential analysis
To establish the extent to which project control mechanisms influences the relationship between rural electrification expansion strategies and implementation of energy access projects	Project control mechanisms combined rural electrification expansion strategies Independent Variable	• Number of schools, commercial and household connections • Frequency of Maintenance • Number Project completion within budget • Number Project completion within time	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Ordinal • Interval	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis • Multiple regression analysis	• Descriptive analysis • Inferential analysis

Implementation of energy access projects	Dependent Variable	• Number of schools, commercial and household connections • Frequency of Maintenance • Number Project completion within budget • Number Project completion within time	A composite Index was obtained by calculating the average of the total sum of responses of each respondent	• Ordinal • Interval	• Frequency • Percentage • Mean • Standard Deviation • Pearson product moment correlation analysis • Multiple regression analysis	• Descriptive analysis • Inferential analysis

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter of the study presents the results of data analysis which has been conducted in line with the specific study's objectives. It begins by analyzing the response rate of the questionnaires, and then followed by analyzing the demographic profiles of the respondents, after which statistical assumptions and preliminary tests of the data are analyzed and discussed. The preceding sections thereafter analyze the descriptive statistics of the data, followed by inferential statistics and finally the summary of the findings.

Descriptive statistics was first conducted for every objective of the study by use of frequencies, means and standard deviation and further followed by inferential statistics. All through the data analysis, the dependent variable of analysis was implementation of energy access projects and the independent variables were: project planning, project service outsourcing, project fund mobilization and project company while project control mechanisms as the moderating variable.

4.2 Response Rate

The 373 respondents determined by Slovin's formula were given questionnaires to fill. Out of these 302 of them came back filled while 71 were either incomplete or not at all filled. This represented a return rate of 81% which is generally representative enough for analysis and even generality of results to the population. The results are in tandem with studies by Babbie (2003) that states that a return rate of 50% is sufficient to rely on the questionnaire for purposes of analysis. Further he stated that a return rate of 60% was considered to be good and 70% was assumed to be excellent for data analysis.

4.3 Background Information of the Respondents

This section of the chapter discusses the respondents' background information. All the statements that are discussed in the study are based on the data as obtained from questionnaires.

The areas covered include the gender, age, levels of education and period lived or worked in the area.

4.3.1 Distribution of Respondents by Gender

The respondents were categorized in terms of their gender, to establish their percentages. Right at the start of the study, they identified their genders. The results of the distribution of respondents by gender are shown in Table 4.1:

Table 4.1: Distribution of Respondents by Gender

Gender	Frequency	Percentages (%)
Male	208	69
Female	94	31
Total	**302**	**100**

Results in Table 4.1 show that 208 (69%) of them were male whereas 94 (31%) were female. The gender distribution of the respondents was good as the government usually recommends a sector to have at least a representation of 30% of the opposite gender. This implied the results were representative as far as gender rule is concerned. The low number of females was largely because of gender disparity that has persisted in the target area for a long time. Accordingly, women were at a disadvantaged level in comparison to men who have dominated most areas of lives in those areas.

4.3.2 Distribution of Respondents by Age

To ascertain whether there was equality at age level, the respondents were requested to indicate their age on the questionnaires. The age group categorization of the results as it could be an indicator or reliability, where we would expect those middle-aged to have more experience in their responses as compared to the young and the old who might have forgotten some few aspects or outdated with events. The age groups were classified in five categories and their results were as in Table 4.2:

Table 4.2: Distribution of Respondents by Age

Age Groups	Frequency	Percent
Under 30 Years	34	11.3
31 - 40 Years	90	29.8
41 - 50 Years	96	31.8
51 - 60 Years	60	19.9
Over 60 Years	22	7.3
Total	302	100

The results in Table 4.2 show that those below 30 years was 34 (11.3%), those between 31-40 years was 90 (29.8%), those between 41-50 years was the highest at 96 (31.8%), those of 51-60 Years was 60 (19.9%) and the least was those of over 60 years at 22 (7.3%). The results show that the majority of them were aged between 31 and 50 years, which was a prime age group for the responses, an indicator of reliability of the results.

4.3.3 Distribution of Respondents by Levels of Education

To determine how well the respondents understood the questions and how well they also responded to the same questions, it was important to gauge their levels of education. Accordingly, they also provided their levels of education and the results are as shown in Table 4.3:

Table 4.3: Distribution of Respondents by Levels of Education

Levels of Education	Frequency	Percent
Post-secondary Artisan Certificate	48	15.9
Diploma	120	39.7
Undergraduate	88	29.1
Masters	18	6
PhD	3	1
Others	25	8.3
Total	302	100

Table 4.3 depicts that 48 (15.9%) of the respondents had attained post-secondary artisan certificate, 120 (39.7%) had a diploma, 88 (29.1%) had attained an undergraduate level of education, 18 (6%) had master degrees, 3 (1%) had a PhD and 25(8.3%) had attained other levels of education not in the categories given. The results are not surprising that the highest proportion of the respondents indicated that they had attained a diploma; this is because the study was based on rural areas of the country. This is important, since diploma holders are taken to be literate enough to give reliable responses.

4.3.4 Distribution of Respondents by Period Lived or Worked in the Area

For the purpose of knowing the extent of level of experience in terms of the subject of the study, the study evaluated the number of years that respondents had lived/worked in area of study before. This was important because it indicated their levels of internalization of the environment of study. The periods were categorized as those less than one year, those between 1 and 5 years, 6 – 10 years, 11 – 15 years, and 16 – 20 years, as well as those over 20 years. The results of the analysis are shown in Table 4.4:

Table 4.4: Distribution of Respondents by Period Lived or Worked in the Area

Period Lived or Worked in the Area	Frequency	Percent
Less than 1 Year	21	7
1 - 5 Years	56	18.5
6 - 10 Years	82	27.2
11 - 15 Years	66	21.9
16 - 20 Years	46	15.2
Over 20 Years	31	10.3
Total	302	100

Table 4.4 indicates that 27.2% of the respondents either lived or worked in the area between 6 to 10 years, this proportion was closely followed by those who lived or worked in the area for more than 10 years but less than 15 years. The least percentage of 7% were those who had lived or worked in the area for less than one year. An important implication of these findings is that the response from the questionnaires can highly be relied on since there is a component of a long period of observations.

4.4 Tests for Statistical Assumptions and Analysis of Likert Type of Data

To understand the suitability of the data used in the study for statistical analysis, a number of tests were conducted. This section provides details relating to the way the tests of normality and multicollinearity were conducted. Further, the section discusses the way type I and II errors were controlled and the suitability of using the Likert scale in the study.

4.4.1 Normality Test

In order to avoid inaccurate inferential statistic results, a normality test is necessary. The idea behind normality test is to test if the data has a normal distribution. The tests can either be based on visual inspection where one looks at the distribution of the data by assessing the plots of skewness and kurtosis, or by doing formal statistical tests particularly based on Kolmogorov-Smirnova and Shapiro-Wilk. The study carried out the normality tests and the results are as presented in Table 4.5:

Table 4.5: Results for Kolmogorov-Smirnova and Shapiro-wilk Normality Tests

Statements	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
a) Project Control Mechanisms	0.013	302	0.188	0.993	302	0.168
b) Implementation of Energy Access Projects	0.021	302	0.196	0.984	302	0.176
c) Project Planning	0.03	302	0.105	0.983	302	0.185
d) Project Service Outsourcing	0.03	302	0.105	0.965	302	0.185
e) Project Fund Mobilization	0.009	302	0.184	0.975	302	0.164
f) Project Company	0.041	302	0.116	0.964	302	0.196

Results in Table 4.5 show that the entire Kolmogorov-Smirnova statistic was close to 0 and the Shapiro-Wilk was close to 1. This was an indication that the sample chosen had a normal distribution. The null hypothesis for Kolmogorov-Smirnova presumes that the sample is not normally distributed whereas its alternative is that it is normally distributed. Table 4.5 depicts

that the p-values were more than 0.05 implying that null hypothesis should be rejected and concluded that sample as normally distributed.

4.4.2 Multicollinearity Test

Multicollinearity usually occurs when correlation between independent variables is strong; implying that there is a statistical linear relationship between them. In the event two independent variables have a linear relationship they affect their predictability influence on the dependent variable since already they have a relationship which can affect each other when either is changed. The standard measure of multicollinearity is using the Variance Inflation Factor (VIF). According to Marquardt, (1970) an inflation factor of beyond 10 is an indicator of multicollinearity, other scholars are of the view that a mean VIF of beyond 4 is an indicator of multicollinearity among all the variables. The study adopted this approach and the results are as shown in Table 4.6:

Table 4.6: Variance Inflation Factor (VIF) Results

Independent Variables	Collinearity Statistics	
	Tolerance	VIF
Project Control Mechanisms	0.559	1.79
Project Planning	0.64	1.564
Project Service Outsourcing	0.639	1.564
Project Fund Mobilization	0.704	1.421
Project Company	0.786	1.272
Mean		**1.522**
a Dependent Variable: Implementation of Energy Access Projects		

From Table 4.6, it is evident that the VIFs for independent variables are less than 10, and the mean VIF is 1.522, which is less than 4 an indicator that the variables did not have a linear relationship among themselves. When there is multicollinearity, it increases the standard errors for beta coefficients; hence, there tends to be higher variability across sample. This decreases its likelihood of representing the population. In addition, it also reduces the contribution that each independent variable has towards the dependent variable hence, the significance of predictor variables is reduced significantly.

4.4.3 Control of Type I and Type II Errors

In the event we reject a true hypothesis or do not reject a false one, we commit either type I or type II error. According to Osbone and Waters (2001), the probability of committing both errors can be reduced by removing univariate and bivariate outliers. For the simple correlation and regressions, unreliable measurements are able to increase the likelihood of committing type II errors because they under estimate relationships. For partial correlation and multiple regressions, unreliable measurement for covariate may affect the size of other variables by over-estimating them. To control such eventualities, a correction of low reliability was conducted using the Cronbach alpha of 0.908; thus minimizing the likelihood of overestimation during multiple regressions. Consequently, to reduce further the chances of committing type II error on this study, a large sample of 373 was chosen.

4.4.4 Analysis of Likert Type Data

The questionnaire utilized in the study had 7 sections that were structured in the form of Likert scale questions. The scale had 5 statements ranging from 5=Strongly Agree (SA), 4 = Agree (AG), 3 = Neutral (NE), 2 = Disagree (DS), 1 = Strongly Disagree (SD). The statements for each section were 10, subdivided into subsections of between 3 to 4 statements. The Likert scale analysis was based on Carifio and Rocco (2007) who argues that the scale be; from 4.2 to 5.0 strongly agree, 3.4 to 4.1 be somewhat agree, 2.6 to 3.3 be neutral, 1.8 to 2.6 be somewhat disagree, and 1 to 1.7 be strongly disagree. This gave an equal distance of 0.8 that was observed throughout the data analysis and interpretation process.

The descriptive statistics provided in the study related to implementation of energy access projects, project control mechanisms, project planning, project service outsourcing, project fund mobilization, project company. The statistics were presented in form of means and standard deviations. This was in relation to the responses that the respondents provided in regard to the statements posed to them relating to project implementation. A 5-point Likert scale described earlier on was utilized to measure the responses. The standard deviation depicted the extent of their variance from the means. Accordingly, a smaller value of standard deviation was regarded as a good measure of the extent to which the responses were near to

the mean responses whereas the larger values were taken to indicate the extent to which the responses were spread over the mean responses.

4.5 Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

Rural electrification expansion strategies are very key in implementation of rural energy access projects. Rural electrification expansion strategies were the independent variables of this study with project control mechanisms as the moderating variable. To examine this, an analysis was done to establish the extent to which rural electrification expansion strategies influenced implementation of rural energy access projects in underserved counties in Kenya. Rural electrification expansion strategies were measured in terms of project planning, project service outsourcing, project fund mobilization and project company. To further analyze this, data was put in Likert scale then analyzed using mean and standard deviation. Data was further analyzed to establish the relationship between the various variables and to establish the extent to which rural electrification expansion strategies predicted the implementation of energy access projects.

4.6 Implementation of Energy Access Projects

Implementation of rural energy access projects is the dependent variable of this study. The respondents were asked to rate their levels of satisfaction and it was deemed necessary to ascertain respondents' opinions on the implementation of energy access projects. Perceptions of respondents on each of the following dimensions of implementation of energy access projects: number of households, schools and commercial centers connections, completion of projects within budget and on time, frequency of maintenance and quality of projects completed were each measured within the scale. The Likert scale ranged from 5 - Very Great Extent (VGE), 4 - Great Extent (GE), 3 - Moderate Extent (ME), 2 - Small Extent (SE) and 1 - Very Small Extent (VSE). 5-Strongly Agree (SA), 4-Agree (A), 3-Neutral (N), 2-Disagree (D), and 1-Strongly Disagree (SD). The results are as shown in Table 4.7.

Table 4.7: Descriptive Statistics of Implementation of Energy Access Projects

Statements	VGE F (%)	GE F (%)	ME F (%)	SE F (%)	VSE F (%)	Mean	SD	Total F (%)
Number of Households, Schools and Commercial Centers Connections								
IP1.Funds allocated to energy access projects in my county is enough	6 (2)	28 (9.3)	68 (22.5)	158 (52.3)	42 (13.9)	2.33	0.898	302 (100)
IP2.My level of income allows me to get access to energy connectivity	6 (2)	41 (13.6)	57 (18.9)	151 (50)	47 (15.6)	2.36	0.968	302 (100)
Sub-Composite Mean and standard deviation						**2.34**	**0.933**	
Completion of Projects within Budget								
IP3.Projects were completed within the set budget	6 (2)	42 (13.9)	87 (28.8)	133 (44)	34 (11.3)	2.51	0.936	302 (100)
IP4. The cost of the project matches the expected standards	3 (1)	53 (17.5)	121 (40.1)	119 (39.4)	6 (2)	2.76	0.796	302 (100)
Sub-Composite Mean and standard deviation						**2.68**	**0.866**	
Completion of Projects within Time								
IP5.Projects were implemented within the assigned time frame	4 (1.3)	83 (27.5)	124 (41.1)	84 (27.8)	7 (2.3)	2.98	0.837	302 (100)
IP6. Project delays were experienced during implementation	22 (7.3)	75 (24.8)	120 (39.7)	78 (25.8)	7 (2.3)	3.09	0.941	302 (100)
Sub-Composite Mean and standard deviation						**3.06**	**0.889**	
Frequency of Maintenance								
IP7. Residents were informed of warranty and maintenance schedule	38 (12.6)	109 (36.1)	98 (32.5)	47 (15.6)	10 (3.3)	3.39	1.001	302 (100)
IP8. It takes long for maintenance team to respond to a failure in electricity	7 (2.3)	94 (31.1)	113 (37.4)	76 (25.2)	12 (4)	3.03	0.904	302 (100)
Sub-Composite Mean and standard deviation						**3.21**	**0.957**	

Quality of Projects Completed								
IP9. I experienced less cases of quality of goods supplied for this project	7 (2.3)	77 (25.5)	119 (39.4)	79 (26.2)	20 (6.6)	2.91	0.932	302 (100)
IP10. The quality of implemented projects met the required standards	8 (2.6)	109 (36.1)	110 (36.4)	68 (22.5)	7 (2.3)	3.14	0.876	302 (100)
Sub-Composite Mean and standard deviation						**3.03**	**0.904**	
Composite mean and standard deviation						**2.864**	**0.910**	

Table 4.7 shows the results of the means of 10 statements used to generate data on implementation of energy access projects. A composite mean and standard deviation were computed whereby mean and standard deviation were used for comparison. Statement IP1 on the aspect of funds allocated to energy access projects being enough, the responses were 42 (13.9%) that agreed to the statement to a very small extent, 158 (52.3%) that related to small extent, 68 (22.5%) that that related to moderate extent, 28 (9.3%) that related to great extent and 6 (2%) that related to a very great extent. Consequently, the mean score was 2.33 which was lower than the sub composite mean of 2.34, hence this implies that funds allocated to energy access projects are not enough during implementation. Allocation of sufficient funds is very crucial in avoiding delays during implementation phase. Funds allocation should be made available to the project to hasten implementation of energy access projects. A standard deviation of 0. 898 recorded on this statement was lower than the sub composite standard deviation of 0.933 and thus it can be concluded that the opinion converged.

Statement IP2 was on views about levels of income of the respondents and their access to energy connectivity. The analysis showed that47 (15.6%) of the respondents agreed to the statement to a very small extent, 151 (50%) agreed to it to a small extent, 57 (18.9%)to a moderate extent, 41 (13.6%) to a great extent and 6 (2%) to a very great extent. The mean score was 2.36 higher than the sub - composite mean of 2.34 implying that levels of income was assessed thus allowing residents to get access to energy connectivity. A standard deviation 0.968 was recorded on this statement and was higher than the sub composite standard deviation

of 0.933 and therefore it can be concluded that the opinion diverged. Therefore, factors hindering increased levels of income need thorough check-up and a solution provided to enhance energy access implementation.

Statement IP3 of projects being completed within the set budget showed that 34 (11.3%) of the respondents agreed to this to a very small extent, 133 (44%) to a small extent, 87 (28.8%) to a moderate extent, 42 (13.9%) to a great extent and 6 (2%) to a very great extent. The mean was 2.51 below the sub composite mean of 2.68 hence this implies that projects were not being completed within budget. A standard deviation of 0.936 was obtained and was higher that the sub composite deviation of 0.866 hence the opinion was diverged. It is therefore important for the rural electrification stakeholders to pay keen attention when setting budgets to avoid delays in projects completion during implementation.

Statement IP4 was to determine if the cost of the projects matched the expected standards. On this aspect 6 (2%) of the respondents agreed to this that it was a very small extent, 119 (39.4%) were of the opinion it was to a small extent, 121 (40.1%) were of the opinion it was on a moderate extent, 53 (17.5%) were of the opinion it was on a great extent and 3 (1%) were of the opinion it was on very great extent. The mean was 2.76 which was higher than the sub composite mean of 2.68 which implies that respondents concurred the cost of the project matched the expected standards. A standard deviation of 0.796 was obtained lower than the sub composite deviation of 0.866 hence opinion converged.

Statement IP5 on projects being implemented within the assigned time frame, the results show 7 (2.3%) of the respondents agreed to this that it was a very small extent, 84 (27.8%) were of the opinion it was to a small extent, 124 (41.1%) were of the opinion it was on a moderate extent, 83 (27.5%) were of the opinion it was on a great extent and 4 (1.3%) were of the opinion it was on very great extent. The mean response was 2.98 which was lower than the sub composite mean of 3.06 implying that implementation of projects within assigned timeframe was not adhered to. A standard deviation of 0.837 recorded on this statement was lower than the sub composite standard deviation of 0.889 and therefore it can be concluded that the opinion converged.

Statement IP6 was to determine if project delays were experienced during implementation. On this aspect 7 (2.3%) of the respondents agreed to it to a very small extent, 78 (25.8%) were of the opinion it was to a small extent, 120 (39.7%) were of the opinion it was on a moderate extent, 75 (24.8%) were of the opinion it was on a great extent and 22 (7.3%) were of the opinion it was on very great extent. The mean score of 3.09 obtained was higher than the sub composite mean of 3.06 implying that project delays were minimal. Emerging from this statement was that the standard deviation of 0.941 was obtained which was higher than the sub composite standard deviation of 0.889 hence the opinion diverged. This could be because of contractors not being able to adhere to design specifications during implementation. More so, it could be attributed to limited supervision and monitoring of project activities during implementation as it is necessary to avoid projects prolonging longer than the expected duration.

Statement IP7 was to get a view of the respondents regarding them being informed of warranty and maintenance schedule. On this aspect, 10 (3.3%) of the respondents agreed to this that it was a very small extent, 47 (15.6%) were of the opinion it was to a small extent, 98 (32.5%) were of the opinion it was on a moderate extent, 109 (36.1%) were of the opinion it was on a great extent and 38 (12.6%) were of the opinion it was on very great extent. The mean score of 3.39 obtained was higher than the sub composite mean of 3.21 and this implied the residents were properly informed of the warranty and maintenance schedules. A standard deviation of 1.001 recorded on this statement was higher than the sub composite deviation of 0.957 and therefore it can be concluded that the opinion diverged. This implied despite most of residents being properly informed of the warranty and maintenance schedules, there could still be some ignorance or lack of commitment to follow up with the service providers which would have seen improvement in implementation of energy access projects.

Statement IP8 determined whether the respondents were satisfied with time it took the maintenance team to respond to a failure in electricity. On this aspect 12 (4%) of the respondents agreed to this that it was a very small extent, 76 (25.2%) were of the opinion it was to a small extent, 113 (37.4%) were of the opinion it was on a moderate extent, 94 (31.1%) were of the opinion it was on a great extent and 7 (2.3%) were of the opinion it was on very

great extent. The mean score for this statement was 3.03 against the sub composite mean of 3.21 implying that response of the maintenance team did not respond in time to failures as per the requirements of the residents. A standard deviation of 0.904 was recorded which was below the sub composite standard deviation of 0.957 and hence concluding that the opinion was converged.

Statement IP9 statement was to find views of the respondents on the aspect of experiencing less cases of quality of goods supplied for this project. The results showed that 20(26.6%) of the respondents agreed to this that it was a very small extent, 79 (26.2%) were of the opinion it was to a small extent, 119 (39.4%) were of the opinion it was on a moderate extent, 77 (25.5%) were of the opinion it was on a great extent and 7 (2.3%) were of the opinion it was on very great extent. The mean score of 2.91 was obtained which was lower than the sub composite mean of 3.03 and this implied that goods supplied were of good quality. A standard deviation of 0.932 was obtained and was higher than the sub composite standard deviation of 0.904 hence opinion was diverged.

Statement IP10 was to determine whether the quality of implemented projects met the required standards. On this aspect 7 (2.3%) of the respondents agreed to this that it was a very small extent, 68 (22.5%) were of the opinion it was to a small extent, 110 (36.4%) were of the opinion it was on a moderate extent, 109 (36.1%) were of the opinion it was on a great extent and 8 (2.6%) were of the opinion it was on very great extent. The mean score for this statement was 3.14 against the sub composite mean of 3.04 which was higher implying that the quality of implemented met the required standards. A standard deviation of 0.876 was obtained on this statement and was lower than the sub composite standard deviation of 0.904 hence the opinion converged.

4.7 Project Planning and Implementation of Energy Access Projects

Project planning is very key in the implementation of energy access projects. The study found it necessary to ascertain respondents' opinions on project planning influence on the implementation of energy access projects. Perceptions of respondents on each of the following dimensions of project planning: policy formulation, building capacity and integrating energy

access with development programs were each measured within the scale. The Likert scale ranged from 5-Strongly Agree (SA), 4-Agree (AG), 3-Neutral (NE), 2-Disagree (DS), and 1-Strongly Disagree (SD). The results are as shown in Table 4.8.

Table 4.8: Descriptive Statistics of Project Planning

Statements	**SA F (%)**	**AG F (%)**	**NE F (%)**	**DS F (%)**	**SD F (%)**	**Mean**	**SD**	**Total F (%)**
Policy Formulation								
PP1. I am aware of the Government's initiative to bring electricity to my area	48 (15.9)	159 (52.6)	84 (27.8)	7 (2.3)	4 (1.3)	3.79	0.78	302 (100)
PP2. I am aware that energy access will improve the socio-economic status of my county	72 (23.8)	162 (53.6)	61 (20.2)	7 (2.3)		3.99	0.731	302 (100)
PP3. I was offered clarification and support I required during energy access implementation in my county	17 (5.6)	114 (37.7)	129 (42.7)	41 (13.6)	1 (0.3)	3.35	0.796	302 (100)
PP4. I was briefed on the project prior to implementation	24 (7.9)	127 (42.1)	108 (35.8)	36 (11.9)	7 (2.3)	3.41	0.884	302 (100)
Sub-Composite Mean and standard deviation						**3.64**	**0.800**	
Building Capacity								
PP5. Staff used in energy access projects were regularly trained	3 (1)	138 (45.7)	130 (43)	26 (8.6)	5 (1.7)	3.36	0.723	302 (100)
PP6. Am aware of available facilities for training personnel in energy sector in my area	5 (1.7)	147 (48.7)	117 (38.7)	23 (7.6)	10 (3.3)	3.38	0.788	302 (100)

PP7. I was involved in initiating training needs in my area	7 (2.3)	51 (16.9)	119 (39.4)	120 (39.7)	5 (1.7)	2.78	0.825	302 (100)
Sub-Composite Mean and standard deviation						**3.17**	**0.779**	
Integrating Energy Access with Development Programs								
PP8. I am aware of other ministries that support energy access collaboration among development ministries in my county	13 (4.3)	141 (46.7)	128 (42.4)	17 (5.6)	3 (1)	3.48	0.714	302 (100)
PP9. There is no duplication of energy access projects in my area	2 (0.7)	95 (31.5)	138 (45.7)	63 (20.9)	4 (1.3)	3.09	0.772	302 (100)
PP10.I participated in meetings that determined energy access needs in my county	1 (0.3)	39 (12.9)	127 (42.1)	109 (36.1)	26 (8.6)	2.6	0.832	302 (100)
Sub-Composite Mean and standard deviation						**3.06**	**0.773**	
Composite mean and standard deviation						**3.29**	**0.784**	

Table 4.8 shows the results from the analysis of project planning on implementation of energy access projects. A composite mean and standard deviation were computed whereby mean and standard deviation were used for comparison. Statement PP1 on policy formulation sought to determine the extent to which the respondents were aware of the Government's initiative to bring electricity to their areas. The study results showed that 48 (15.9%) of the respondents agreed strongly to the statement, 159 (52.6%) agreed to it, 84 (27.8%) were neutral, 7 (2.3%) disagreed with it whereas 4 (1.3%) strongly disagreed with it. This gave a mean score of 3.79 which is higher than the sub composite mean of 3.64 which implies that residents were aware of Government's initiative to bring electricity to the area. A standard deviation of 0.78 was obtained and was lower than the sub composite standard deviation of 0.800 hence opinion converged.

Statement PP2 on policy formulation was to find out the extent to which the respondents were aware that energy access will improve the socio-economic status of their counties. The results showed that 72 (23.8 %%) of the respondents strongly agreed, 162 (53.6%) agreed, 61 (20.2%) were neutral, and 7 (2.3%) disagreed. The mean score of 3.99 was obtained which is higher than the sub composite mean of 3.64 which implies that the residents were aware of the benefits of energy access. A standard deviation of 0.731 obtained on this statement was below hence the opinion was converged.

Statement PP3 was to find out whether the respondents were offered clarification and support they required during energy access implementation in their counties. The results showed that 17(5.6%) of the respondents strongly agreed, 114 (37.7%) agreed, 129 (42.7%) were neutral, 41 (13.6%) disagreed and 1 (0.3%) strongly disagreed. A mean score 3.35 was obtained and was lower than the sub composite mean of 3.64 implying that the residents were not offered clarification and support they required. A standard deviation of 0.796 was obtained which was lower than the sub composite standard deviation 0.800 and therefore it can be concluded that the opinion converged.

Statement PP4 was to establish whether the respondents were briefed on the project prior implementation. The results showed that, 24(7.9%) of the respondents strongly agreed, 127 (42.1%) agreed, 108(35.8%) were neutral, 36 (11.9%) disagreed and 7 (2.3%) strongly disagreed. The mean score of 3.41 was obtained which was lower than the sub composite mean of 3.64 implying that residents were not briefed on the project prior to implementation. A standard deviation of 0.884 obtained on this statement was higher than the sub composite standard deviation of 0.800 hence the opinion diverged.

Statement PP5 was to establish whether the staffs used in energy access projects were regularly trained. The results showed that 3 (1%) of the respondents strongly agreed, 138 (45.7%) agreed, 130 (43%) were neutral, 26 (8.6%) disagreed and 5 (1.7%) strongly disagreed. A mean score of 3.36 was obtained and was higher than the sub composite mean of 3.17 implying that trained was offered to the staff. A standard deviation of 0.723 was obtained and was lower than the sub composite standard deviation of 0.779 implying that the opinion was converged.

Statement PP6 was to find out the extent to which the respondents were aware of available facilities for training personnel in energy sector in their areas. The results showed that 5 (1.7 %) of the respondents strongly agreed, 147 (48.7%) agreed, 117(38.7%) were neutral, 23 (7.6%) disagreed and 10(3.3%) strongly disagreed. A mean score 3.38 was obtained as compared to the sub composite mean of 3.17 which was higher hence this implies that the residents were fully aware if the available training facilities in the area. A standard deviation of 0.788 obtained on this statement was higher than the sub composite standard deviation of 0.779 and therefore it can be concluded that the opinion diverged.

Statement PP7 was to establish whether the respondents were involved in initiating training needs in their areas. The results showed that 7(2.3%) of the respondents strongly agreed, 51(16.9%) agreed, 119(39.4%) were neutral, 120 (39.7%) disagreed and 5(1.7%) strongly disagreed. A mean score of 2.78 obtained was lower that the sub composite mean of 3.17 implying that the residents were not involved in initiating training needs. A standard deviation of 0.825 was obtained and was higher than the sub composite standard deviation of 0.779 hence opinion diverged.

Statement PP8 was to find out the extent to which the respondents were aware of the other ministries that support energy access collaboration among development ministries in their counties. The results showed that 13 (4.3%) of them strongly agreed, 141 (46.7%) agreed, 128(42.4%) were neutral, 17 (5.6%) disagreed and 3 (1%) strongly disagreed. The mean score of 3.48 was obtained and was higher than the sub composite mean 3.06 which implies that the residents were aware of the other ministries that support energy access. A standard deviation of 0.714 was obtained and was lower than the sub composite standard deviation of 0.773 hence the opinion converged.

Statement PP9 was to see the respondents' views on duplication of energy access projects in their areas. The results showed that 2 (0.7 %) of them strongly agreed, 95 (31.5%) agreed, 138(45.7%) were neutral, 63 (20.9%) disagreed and 4 (1.3%) strongly disagreed. The mean score was 3.09 higher than the sub composite mean of 3.06 and this implied that there was no

duplication of projects. A standard deviation of 0.772 was obtained and was below the sub composite mean of 0.773 hence the opinion converged.

Statement PP10 was to identify the extent to which the respondents participated in meetings that determined energy access needs in their counties. The results showed that 1(0.3%) of them strongly agreed, 39(12.9%) agreed, 127(42.1%) were neutral, 109 (36.1%) disagreed and 26(8.6%) strongly disagreed. A mean score of 2.6 obtained was lower than the sub composite mean of 3.06 implying that the residents did not participate in meetings organized to address the energy needs. A standard deviation of 0.832 obtained on this statement was above the sub composite mean of 0.773 hence the opinion diverged.

4.7.1 Descriptive Analysis of Project Planning

Project planning was considered in terms of policy formulation, building capacity and integrating energy access projects within development programs. Its mean and standard deviation within rural energy access projects was as shown in Table 4.9:

Table 4.9: Mean and Standard Deviation of Project Planning

Project planning	**n**	**Mean (M)**	**Standard Deviation**
Policy Formulation	302	3.64	0.800
Building Capacity	302	3.17	0.779
Integrating energy access with development programs	302	3.06	0.773
Composite mean		**3.29**	

The results from Table 4.9 show that policy formulation contribute to implementation of energy access projects to a great extent (M = 3.64, SD = 0.80), building capacity to a neutral extent (M = 3.17, SD = 0.779) and integrating energy access with development programs to a neutral extent (M = 3.06, SD = 0.773). This implies that policy formulation is a vital consideration within the process of implementing energy access projects in Kenyan rural areas. The respondents were asked to comment on some challenges they have encountered when enforcing project planning in the area, a number of different views were given, but the notable

ones which appeared to conform to a majority were: lack of proper knowledge by the locals, lack of coordination between rural electrification authority and the private firms in the area, lack of public participation, poor training skills and language barriers. A citation of these challenges reflects why the mean response was at neutral.

To determine the magnitude and direction of the link between project planning and implementation of energy access projects, a correlation analysis was conducted. Project planning is a composite of three indicators; policy formulation, integration of energy access with development programs and capacity building. The correlation results are presented in Table 4.10:

Table 4.10: Correlation between Project Planning and Implementation of Energy Access Projects

		Policy formulation	Building capacity	Integrating energy access with development programs
Implementation of Energy Access Projects	**Pearson Correlation**	.140*	.166*	.118*
	Sig. (2-tailed)	0.015	0.004	0.04
	n	302	302	302

*. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

From the results of Table 4.10, all the indicators of project planning are significantly and positively correlated with implementation of energy access projects. The results from showed a positive and statistically significant influence between policy formulation and implementation of energy access ($r = 0.140^*$; $p<0.05$). Integrating energy access with the development programs on implementation of energy access also had a positive and statistically significant influence ($r = 0.118^*$; $p < 0.05$. Further, the influence of building capacity on implementation of energy access was also positive and statistically significant ($r = 0.166^*$; $p <0.05$). Thus, the results obtained in table 4.10 suggested that an increase in project planning strategy will lead to an increase in the implementation of energy access projects. Therefore,

this study can draw the conclusion that project planning has a positive and statistical significant influence on implementation of energy access projects. Notably however, all the correlations are weak. Correlation however does not mean causality; therein a regression analysis was conducted to verify if there was statistical significant between the indicators of project planning and implementation of energy access projects. Further the researcher went ahead to determine the strength of the relationship project planning and implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the first objective was tested:

Hypothesis 1

1.H_0: Project planning does not influence the implementation of rural energy access projects in underserved counties in Kenya.

Regression model

The following mathematical model was utilized to test the null hypothesis.

$Y = f(X_1, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_1 X_1 + \boldsymbol{\varepsilon}$

Where

Y = Implementation of rural energy access projects

X_1= Project planning

β_o = Constant term

β_1 = Beta Coefficient

$\boldsymbol{\varepsilon}$ = Error term

The data was analyzed using the ordinary least square method and the results of the regression model are presented in Table 4.11:

Table 4.11: Project Planning and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.206	0.042	0.033	3.738

a. Predictors: (Constant) PF, BC, IE

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	184.4	3	61.462	4.399	0.005
Residual	4163.1	298	13.970		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) PF, BC, IE

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	21.401	2.079		10.292	0
Policy Formulation	0.2	0.119	0.101	1.685	0.093
Building Capacity	0.243	0.135	0.112	1.803	0.072
Integrating Energy	0.204	0.144	0.084	1.42	0.157

Dependent Variable: Implementation of Energy Access Projects

In the establishment of how useful the predictor variables could be, Cohen and Cohen (1983) recommended that the *t*- values should be less than -1.96 or greater than +1.96. Accordingly, a large t-value on either side and a smaller p-value, tend to suggest that the independent variable contributes sufficiently to the predicted variable in order to support the regression model as fit and applicable.

The standardized coefficients β value of the computed scores of policy formulation was 0.101 with a t-test of 1.685 and at a significance level of p = 0.093 implying that for every 1 per cent increase in policy formulation there was a predicted increase in the percentage of implementation of energy access of zero. Equally, the standardized regression coefficients β value of the computed scores of building capacity was 0.112 with a t-test of 1.803 and at a significance level of p = 0.072. This implied that for every 1 per cent increase in building capacity there was a predicted increase in the percentage of implementation of energy access of zero. Further, the standardized coefficients β value of the computed scores of integrating

energy access was 0.084 with a t-test of 1.42 and at a significance level of p = 0.157. The results of this variable can be concluded that, the regression model obtained in table 4.11 is confirmed to be significant and feasible.

The results in Table 4.11 were further analyzed for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model. The outcome was that the test of coefficient of determination was $R^2 = 0.042$ and r = 0.206, an indicator that generally project planning is weakly correlated with implementation of energy access projects. The $R^2 = 0.042$ was the coefficient of determination for this model and it depicted that project planning explained 4.2 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 95.8% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project planning that were not captured in this model. In terms of individual indicators of project planning, both policy formulation and building capacity are statistically significant at 10% level of significance, since for policy formulation $p = 0.093 < 0.1$ and for building capacity $p = 0.072 < 0.1$.

The β coefficient test degree of change in the outcome variable for every one-unit of change in the predictor variable of every individual predictor variable on the independent variable was carried out. The results as per Table 4.11 on the nature of relationship between the individual variables using the Beta coefficients depicted that all the indicators apart from integrating energy access projects 0.084, were not statistically significant at 10% (p = 0.157). Policy formulation Beta coefficient of 0.101 was statistically significant at 10% (p = 0.093) implying that there was a positive relationship that was significant between policy formulation and implementation of energy access projects. The coefficient building capacity 0.112 was also statistically significant at 10% (p < 0.072) implying also that building capacity had a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable building capacity seem to influence implementation of access projects more than policy formulation.

The general F statistic of F = 4.399($p < 0.05$) was significant because P = 0.000<0.05. This was an indication of a statistical relationship between the two variables. Accordingly, the null hypothesis was rejected. It was then concluded that project planning had notable influence on the implementation of rural electrification projects in the underserved counties in the country. With the help of the results, the regression model that was developed was as follows;

$Y = 21.401 + 0.2PF + 0.243BC + 0.204IE$

Where;

Y = Implementation of Energy Access Projects

PF = Policy Formulation

BC = Building Capacity

IE = Integrating Energy

The results on the influence of project planning strategy on implementation of energy access projects in underserved counties in Kenya are similar to study findings by Singer (2014) who established that proper project planning strategies were able to streamline regulations and create incentives that could stimulate a new market for energy access, attract private enterprises into energy sector and promote financing. This could be important in leveraging the scarce resources from government so that more people could be connected to electricity. The author further argues that government could collaborate with different stakeholders to comprehend their market needs so that it can formulate policies that could attract private investors and expand the energy market. Nonetheless, the policies ought to be flexible so that they can accommodate a wide range of actors. Policy consistency and clarity could be important in this process because it could remove barriers, promote stable market for energy and investment from private sector. Results obtained from respondents on policy formulation concur with study findings by Macharia and Ngugi (2014) who evaluate the factors that determine the success of project completion within the national power lighting company. The authors note that government policies played major roles in project completion because they influenced structure, performance and size of projects implemented by government entities. The findings were also in line with those by Njoki (2013) who claimed that policies should facilitate the process of implementing projects by upholding the integrity of those projects to make sure that

informed decisions are made that require the execution of public infrastructure projects to be based on accurate information as well as make sure that basic requirements are met.

Considering building capacity, the study finding by Hande and Surabhi (2015) found out that strategies focusing on people involved in marketing practices could be vital in marketing just as technologies themselves. Accordingly, the process of building capacity in this area could be vital in areas related to sales, servicing, community involvement, research and development as well as finance among other areas. The interviews conducted in the current study established that building capacity was a major indicator that respondents viewed as most valued to them as it will ensure sustainability of the implemented projects. This was greatly supported by a study on off grid energy access by Chaurey *et al.,* (2010) established that when energy access was approached without promoting domestic capacity to support its market, energy projects could not be supported in the long term. This raises concerns relating to the sustainability of such projects. A study by Terri *et al*., (2015) claimed that development programs by various ministries in government could act as valuable vehicles for implementing energy access projects as well as attract and leverage funding for such projects. Accordingly, the authors argued that different countries were using cross-ministerial energy access efforts to support projects aimed at reducing the emission of greenhouse gases, improve health, respond to disasters and alleviate poverty. The results obtained from the interviews established that integrating energy access received a fair rating as most respondents agreed on the awareness of other ministries that supported energy access in their various counties and that there was a fair representation in collaboration.

Nonetheless, the results were in conflict with those by Tomas and Sanchez (2013) who studied the influence of economic poverty and lack of political will on electricity access whose results showed that that economic poverty and lack of political will as two important factors influencing the electricity access to rural households. In spite of this, the results were largely in line with researcher's expectations.

4.8 Project Service Outsourcing and Implementation of Rural Energy Access Projects

Project service outsourcing is a vital factor in the implementation of energy access projects. To examine this an analysis was done to determine the extent to which project service outsourcing influenced implementation of rural energy access projects in underserved counties in Kenya. It was deemed necessary to ascertain respondents' opinions on project service outsourcing influence on the implementation of energy access projects. Perceptions of respondents on each of the following dimensions of project planning: scope of project activities, technology customization and innovation and development of business models were each measured within the scale. The Likert scale ranged from 5-Strongly Agree (SA), 4-Agree (AG), 3-Neutral (NE), 2-Disagree (DS), and 1-Strongly Disagree (SD). The results are as shown in Table 4.12.

Table 4.12: Descriptive Statistics of Project Service Outsourcing

	SA F (%)	AG F (%)	NE F (%)	DS F (%)	SD F (%)	Mean	SD	Total F (%)
Scope of Project Activities								
PS1.I support the initiative of project service outsourcing in ensuring that more remote areas in my county are covered	95 (31.5)	162 (53.6)	37 (12.3)	5 (1.7)	3 (1)	4.13	0.76	302 (100)
PS2.Electricity connectivity has increased due to outsourcing to private sector	88 (29.1)	149 (49.3)	56 (18.5)	5 (1.7)	4 (1.3)	4.03	0.814	302 (100)
PS3. I am aware of capability of outsourced firms in my county	40 (13.2)	152 (50.3)	99 (32.8)	8 (2.6)	3 (1)	3.72	0.762	302 (100)
Sub-Composite Mean and standard deviation						**3.96**	**0.779**	
Technology Customization and Innovation								
PS4. Up to date technology was used in the energy access project	6 (2)	114 (37.7)	145 (48)	33 (10.9)	4 (1.3)	3.28	0.736	302 (100)
PS5. The needed technology was readily available	3 (1)	88 (29.1)	162 (53.6)	44 (14.6)	5 (1.7)	3.13	0.726	302 (100)
PS6. I understand that technology offered addressed the needs of my county	22 (7.3)	120 (39.7)	129 (42.7)	22 (7.3)	9 (3)	3.41	0.845	302 (100)
Sub - Composite Mean and standard deviation						**3.27**	**0.769**	
Development of Business Models								
PS7. Affordable models are available	9 (3)	143 (47.4)	123 (40.7)	20 (6.6)	7 (2.3)	3.42	0.759	302 (100)

PS8. There are more products in the market because of outsourcing	8 (2.6)	134 (44.4)	124 (41.1)	30 (9.9)	6 (2)	3.36	0.776	302 (100)
PS9. Products are serving us longer and are user friendly	21 (7)	111 (36.8)	126 (41.7)	42 (13.9)	2 (0.7)	3.35	0.829	302 (100)
PS10. I participated in deciding the type of model used in my county	7 (2.3)	101 (33.4)	141 (46.7)	42 (13.9)	11 (3.6)	3.17	0.828	302 (100)
Sub-Composite Mean and standard deviation						**3.33**	**0.798**	
Composite mean and standard deviation						**3.52**	**0.782**	

Table 4.12 shows the results from the analysis of project service outsourcing on implementation of energy access projects. A composite mean and standard deviation were computed whereby mean and standard deviation were used for comparison. Statement PS1 sought to determine the extent to which the respondents supported the initiatives of project service outsourcing in ensuring that more remote areas in their counties are covered. The results showed that 95 (31.5%) of them strongly agreed, 162 (53.6%) agreed, 37 (12.3%) were neutral, 5 (1.7%) disagreed and 3 (1%) strongly disagreed with the statement. The mean score of 4.13 obtained was higher than the sub composite mean of 3.96 implying that the residents supported the project service outsourcing initiative. A standard deviation of 0.76 obtained on this statement was below the sub composite standard deviation of 0.779 hence the opinion converged.

Statement PS2 was to find out the extent to which the respondents were in agreement that outsourcing to private sector more people now have access to energy in their areas. The study results showed that 88 (29.1 %%) of them strongly agreed, 149 (49.3%) agreed, 56 (18.5%) were neutral, 5 (1.7%) disagreed and 4 (1.3%) strongly disagreed with the statement. The mean score obtained for this statement was 4.03 which was higher than the sub composite mean 3.96 implying the residents were aware of the need to outsource services from the private sector. A standard deviation of 0.814 obtained on this statement was higher than the sub composite mean of 0.779 and therefore it can be concluded that the opinion diverged.

Statement PS3 was to find out whether the respondents were aware of capability of outsourced firms in their counties. The results showed that 40(13.2%) of them strongly agreed, 152 (50.3%) agreed, 99 (32.8%) were neutral, 8 (2.6%) disagreed and 3 (1%) strongly disagreed with the statement. The mean score was 3.72 below the sub composite mean of 3.96 hence this implies that residents were not aware of the capacity of outsourced firms. A standard deviation of 0.762 was obtained and was below that of the sub composite standard deviation of 0.779 hence the opinion converged.

Statement PS4 was to establish whether up to date technology was used in the energy access project. The results showed that 6 (2%) of the respondents strongly agreed, 114 (37.7%) agreed, 145 (48%) were neutral, 33 (10.9%) disagreed and 4 (1.3%) strongly disagreed with the statement. The mean score was 3.28 slightly above the sub composite mean of 3.27 implying that the residents were satisfied the technology used in the implementation of energy access projects. A standard deviation of 0.736 obtained was lower than the sub composite standard deviation of 0.769 hence the opinion converged.

Statement PS5 was to find out whether the needed technology was readily available. The results showed that 3 (1%) of the respondents strongly agreed, 88 (29.1%) agreed, 162(53.6%) were neutral, 44(14.6%) disagreed and 5(1.7%) strongly disagreed with the statement. The mean score was 3.13 below the sub composite mean of 3.27 hence this implies the residents were not satisfied with the availability of the technology. A standard deviation of 0.726 obtained was below the sub composite standard deviation of 0.769 and hence the opinion converged.

Statement PS6 was to establish whether the respondents understood that technology offered addressed the needs of their counties. The study results showed that 22(7.3%) of the respondents strongly agreed, 120(39.7%) agreed, 129(42.7%) were neutral, 22(7.3%) disagreed and 9(3%) strongly disagreed with the statement. The mean score was 3.41 higher than the sub composite mean of 3.27 and this implied that the residents understood that the technology being offered would address their needs. A standard deviation of 0.845 obtained

on this statement was higher than the sub composite standard deviation of 0.769 and thus it can be concluded that the opinion diverged.

Statement PS7 whether the respondents think Governments outsourcing strategy brought in models that are affordable to people in their areas. The results showed that 9 (3%) of the respondents strongly agreed, 143 (47.4%) agreed, 123(40.7%) were neutral, 20 (6.6%) disagreed and 7 (2.3%) strongly disagreed with the statement. The mean score was 3.42 above the sub composite mean of 3.33 hence this implies that residents were satisfied that the governments outsourcing strategy brought in models that are affordable. A standard deviation of 0.759 was obtained and was below the sub composite standard deviation of 0.798 hence the opinion converged.

Statement PS8 was to check whether there are more products in the market because of outsourcing. The results showed that 8 (2.6%) of the respondents strongly agreed, 134(44.4%) agreed, 124(41.1%) were neutral, 30 (9.9%) disagreed and 6 (2%) strongly disagreed with the statement. A mean score of 3.36 obtained was higher than sub composite mean of 3.33 implying that there were more products in the market because of outsourcing. A standard deviation of 0.776 obtained was below the sub composite mean of 0.798 hence the opinion converged.

Statement PS9 was to find out whether the respondents thought products are serving them longer and are user friendly. The results showed that 21(7%) of the respondents strongly agreed, 111 (36.8%) agreed, 126 (41.7%) were neutral, 42 (13.9%) disagreed and 2 (0.7%) strongly disagreed with the statement. The mean score was 3.35 slightly higher than the sub composite mean of 3.33 and this implied that products supplied during implementation served residents longer and were user friendly. A standard deviation of 0.829 obtained was higher than the sub composite standard deviation of 0.798 and thus it can be concluded that the opinion diverged.

Statement PS10 was to establish whether the respondents participated in deciding the type of model used in their counties. The study results showed that 7(2.3%) of them strongly agreed,

101 (33.4%) agreed, 141(46.7%) were neutral, 42 (13.9%) disagreed and 11 (3.6%) strongly disagreed. The mean score was 3.17 below the sub composite mean of 3.33 hence this implies that the residents did not participate in making decisions on the model deployed. A standard deviation of 0.828 obtained on this statement was above the sub composite standard deviation of 0.798 hence the opinion diverged.

4.8.1 Descriptive Analysis of Project Service Outsourcing

Project service outsourcing was considered in terms of scope of project activities, technology customization and innovation and development of business models. The results are as shown in Table 4.13:

Table 4.13: Mean and Standard Deviation of Project Service Outsourcing

Project Service Outsourcing	**n**	**Mean (M)**	**Standard Deviation**
Scope of Project Activities	302	3.96	0.779
Technology Customization and Innovation	302	3.27	0.769
Development of Business Models	302	3.33	0.798
Composite mean		**3.52**	

Table 4.13 show that Scope of Project activities contribute to implementation of energy access projects to a great extent (M = 3.96, SD = 0.779), Technology Customization and Innovation to a neutral extent (M = 3.27, SD = 0.769) and Development of Business Models to a neutral extent (M = 3.33, SD = 0.798). This implies Scope of Project activities is vital when implementing energy access projects in rural areas of Kenya. The overall composite mean shows project service outsourcing is an important explanatory variable for implementation of the rural energy projects.

A correlation analysis was carried out to ascertain the direction and magnitude of the relationship between implementation of energy access projects and project service outsourcing. Project service outsourcing is a composite of three indicators; scope of project

activities, technology customization and innovation and development of business models. The results in Table 4.14:

Table 4.14: Correlation between Project Service Outsourcing and Implementation of Energy Access Projects

		Scope of Project activities	Technology customization and innovation	Development of business models
Implementation of Energy Access Projects	**Pearson Correlation**	0.054**	.209*	.214*
	Sig. (2-tailed)	0.348	0.000	0.000
	n	302	302	302

* The value is significant at 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

From the results of Table 4.14, two indicators of project service outsourcing are significantly positively correlated with implementation of energy access projects. The two indicators are technology customization and innovation and development of business models. The results from showed a positive and statistically significant influence between technology customization and innovation and implementation of energy access ($r = 0.209^*$; $p<0.05$). Development of business models on implementation of energy access also had a positive and statistically significant influence ($r = 0.214^*$; $p < 0.05$. However, although scope of project activities influence on implementation of energy access was positive, it was rather not significant ($r = 0.054^{**}$, $p = 0.348$) since the $p > 0.05$. Thus, the results obtained in table 4.14 suggested that an increase in project service outsourcing strategy can be of great significance in the pursuit to increase in the implementation of energy access projects. Therefore, this study can draw the conclusion that project service outsourcing has a positive and statistical significant influence on implementation of energy access projects. Notably however, all the correlations are weak. As correlation does not mean causality, a regression analysis was conducted to verify if there is a statistical relationship between the indicators of project service outsourcing and implementation of energy access projects. Further the researcher went ahead to establish the strength of relationship between project service outsourcing and

implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the second objective was tested:

Hypothesis 2

2.$H_{0:}$ Project service outsourcing does not influence the implementation of rural energy access projects in underserved counties in Kenya.

Regression model

The following mathematical model was utilized to test the null hypothesis.

$Y = f(X_{2,} \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_2 X_{2+} \boldsymbol{\varepsilon}$

Where

Y = Implementation of rural energy access projects

X_2= Project service outsourcing

β_o = Constant term

β_2 = Beta Coefficient

$\boldsymbol{\varepsilon}$ = Error term

The data was analyzed using the ordinary least square method and the results of the regression model are as presented in Table 4.15:

Table 4.15: Project Service Outsourcing and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.254	0.064	0.055	3.694

a. Predictors: (Constant) SP, TC, DB

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	280.2	3	93.39	6.842	0.005
Residual	4067.3	298	13.649		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) SP, TC, DB

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	22.403	1.925		11.638	0
Scope of project activities	-0.103	0.144	-0.043	-0.712	0.477
Technology customization and innovation	0.344	0.141	0.157	2.441	0.015
Development of business models	0.297	0.117	0.159	2.535	0.012

Dependent Variable: Implementation of Energy Access Projects

The standardized coefficients β value of the computed scores of technology customization and innovation was 0.157 with a t-test of 2.441 and at a significance level of p = 0.015 implying that for every 1 per cent increase in policy formulation there was a predicted increase in the percentage of implementation of energy access of zero. Equally, the standardized regression coefficients β value of the computed scores of development of business models was 0.159 with a t-test of 2.535 and at a significance level of p = 0.012. This implied that for every 1 per cent increase in building capacity there was a predicted increase in the percentage of implementation of energy access of zero. However, the standardized coefficients β value of the computed scores of scope of project activities was negative 0.043 with a t-test of negative 0.712 and at a significance level of p = 0.477. Since the t-values of two indicators is greater than +1.96, the regression model obtained in table 4.15 is confirmed to be significant and feasible.

The results in Table 4.15 were further analyzed for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model. The outcome was that the test of coefficient of determination $R^2 = 0.064$ and r = 0.254, an indicator that generally project service outsourcing is weakly correlated with implementation of energy access projects. The $R^2 = 0.064$ was the coefficient of determination for this model and it depicted that project service outsourcing explained 6.4 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 93.6% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project service outsourcing that were not captured in this model. In terms of individual indicators of project service outsourcing, both technology customization and innovation and development of business models are statistically significant at 5% level of significance, since for technology customization and innovation $p = 0.015<0.05$ and for development of business models $p = 0.012<0.05$.

The β coefficient test of the degree of change in the outcome variable for every one-unit of change in the predictor variable of every individual predictor variable on the independent variable was carried out. The results as per Table 4.15 depicted that all the indicators apart from scope of project activities -0.043, was not statistically significant at 10% (p = 0.477). Technology customization and innovation Beta coefficient of 0.157 was statistically significant at 10% (p = 0.015) implying presence of a positive significant relationship between technology customization and innovation and implementation of energy access projects. The coefficient of development of business models 0.159 is also statistically significant at 10% (p = 0.012) level of significance implying also that development of business models had a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable development of business models seems to influence implementation of access projects more than technology customization and innovation.

In terms of the composite indicator of project service outsourcing, the overall F statistic of $F=6.842(p <0.05)$ was statistically significant since $P = 0.000<0.05$. This was an indication that the link between projects service outsourcing and implementation of rural energy access projects in underserved counties in Kenya was statistically significant. Therefore, the second

null hypothesis that stated that: *2.H_0: Project service outsourcing did not influence the implementation of rural energy access projects in underserved counties in Kenya* was rejected. This decision implied that project service outsourcing had a significant influence on the project implementation among the energy access projects in underserved counties in the country.

With the help of the results in Table 4.15, the regression model developed to represent such an expression was indicated as:

Y = 22.403 - 0.103SP + 0.344TC + 0.297DB

Where;

Y = Implementation of Energy Access Projects

SP = Scope of Project activities

TC = Technology customization and innovation

DB = Development of business models

The results on the influence of project service outsourcing strategy on the implementation of energy access projects were in concurrence with studies by Franz and Bozhil, (2014) who established that project service outsourcing would help organizations to deliver on their mandate by making use of best practices in the industry especially outsourcers who make use of those practices. The study is further supported by a study by Mills, (2014) who observes that when small enterprises at local level are supported could be instrumental in service delivery that meets local needs because they understand local markets. The findings from the current study showed that the respondents agreed that they supported the initiatives of project service outsourcing in ensuring that more remote areas in their counties are covered. The results from interviews showed that the respondents seem to agree that project service outsourcing is important for implementation of projects in the rural areas, however they are of the view that the technology being used is not easily understood by the locals and as such more training is needed so as to enhance cooperation between these firms and the locals when executing these tasks. The study findings are supported by a study by Murphy and Sharma (2014) on technology customization and standardization who emphasized that it is the technology on which a business model thrives. Technology optimization helps in scaling up energy projects. This study therefore benefits the practitioners in the energy sector in the

underserved counties on the influence of project service outsourcing strategy and implementation of energy access projects in underserved counties in Kenya.

4.9 Project Fund Mobilization and Implementation of Energy Access Projects

Project fund mobilization is a vital factor in the implementation of energy access projects. To examine this, an analysis was done to determine the influence of fund mobilization on implementation of rural energy access projects in underserved counties in Kenya. To further analyze this, data was put in Likert scale then analyzed using mean and standard deviation. Data was further analyzed to establish the link between the two variables and to establish how the independent variable predicted the dependent variable. Perceptions of respondents on each of the following dimensions of project fund mobilization: attracting private investments; leverage funding, attract impact investors were each measured within the scale. The Likert scale ranged from 5-Strongly Agree (SA), 4-Agree (AG), 3-Neutral (NE), 2-Disagree (DS), and 1-Strongly Disagree (SD). The results are in Table 4.16.

Table 4.16: Descriptive Statistics of Project Fund Mobilization

Statements	SA F (%)	AG F (%)	NE F (%)	DS F (%)	SD F (%)	Mean	SD	Total F (%)
Attracting Private Investments								
PFM1. I am aware of private funding companies operating in the energy access projects in my area	10 (3.3)	149 (49.3)	107 (35.4)	29 (9.6)	7 (2.3)	3.42	0.802	302 (100)
PFM2. Am aware of the challenges in securing funding in the energy sector in my area	80 (26.5)	151 (50)	60 (19.9)	10 (3.3)	1 (0.3)	3.99	0.792	302 (100)
PFM3. Investment in the energy sector has significantly increased in my area	4 (1.3)	67 (22.2)	108 (35.8)	116 (38.4)	7 (2.3)	2.82	0.849	302 (100)

PFM4. I support the role played by project funding institutions in my county	17 (5.6)	164 (54.3)	115 (38.1)	4 (1.3)	2 (0.7)	3.63	0.643	302 (100)
Sub-Composite Mean and standard deviation						**3.45**	**0.772**	
Leverage Funding								
PFM5. Enough funding was available at all times during project implementation		23 (7.6)	124 (41.1)	153 (50.7)	2 (0.7)	2.56	0.643	302 (100)
PFM6. Disbursement of funds was done on schedule	2 (0.7)	22 (7.3)	150 (49.7)	122 (40.4)	6 (2)	2.64	0.676	302 (100)
PFM7. Due to partnership with funding institutions, connectivity has increased	18 (6)	146 (48.3)	114 (37.7)	22 (7.3)	2 (0.7)	3.52	0.746	302 (100)
Sub-Composite Mean and standard deviation						**2.9**	**0.688**	
Attract Impact Investors								
PFM8. I am aware of the role played by the government and funding institutions in increasing energy investors in my county	4 (1.3)	129 (42.7)	141 (46.7)	24 (7.9)	4 (1.3)	3.35	0.702	302 (100)
PFM9. Am aware of the role of impact investors in my county	19 (6.3)	78 (25.8)	128 (42.4)	69 (22.8)	8 (2.6)	3.1	0.915	302 (100)
PFM10. Creating a conducive environment increased investment in the energy projects in my area	100 (33.1)	137 (45.4)	53 (17.5)	8 (2.6)	4 (1.3)	4.06	0.855	302 (100)
Sub-Composite Mean and standard deviation						**3.50**	**0.824**	
Composite mean and standard deviation						**3.283**	**0.761**	

Table 4.16 shows the results from the analysis of project fund mobilization on implementation of energy access projects. A composite mean and standard deviation were computed whereby mean and standard deviation were used for comparison. Statement PFM1 sought to determine the extent to which the respondents were aware of private funding companies operating in the energy access projects in their areas. The results showed that 10(3.3%) of them strongly agreed, 149 (49.3%) agreed, 107 (35.4%) were neutral, 29 (9.6%) disagreed and 7 (2.3%) strongly disagreed with the statement. A mean score of 3.42 obtained was lower than the sub composite mean of 3.45 implying that residents were not aware of private firms operating in their localities. A standard deviation of 0.802 obtained was above the sub composite standard deviation of .0772 hence the diverged.

Statement PFM2 was to find out the extent to which the respondents were aware about the challenges in securing funding in the energy sector in their areas. The study results showed that 80 (26.5 %%) of them strongly agreed, 151 (50%) agreed, 60 (19.9%) were neutral, 10(3.3%) disagreed and 1(0.3%) strongly disagreed with the statement. The mean score was 3.99 higher than the sub composite mean of 3.45 and this implies that the residents were aware of the challenges in securing funding in the energy sector. A standard deviation of 0.792 recorded on this statement was higher that the sub composite standard deviation of 0.772 and therefore it can be concluded that the opinion diverged.

Statement PFM3 was to find out whether the respondents think the Government has done enough to attract investments in the energy sector in their areas. The results showed that 4(1.3%) of them strongly agreed, 67(22.2%) agreed, 108 (35.8%) were neutral, 116 (38.4%) disagreed and 7 (2.3%) strongly disagreed with the statement. The mean score was 2.85 less than the sub composite mean of 3.45 and this implied that residents were of the opinion that the governments had not done enough to attract investments in the energy sector. A standard deviation of 0.849 obtained was above the sub composite standard deviation of 0.772 hence the opinion was diverged.

Statement PFM4 sought to determine whether the respondents supported the role played by project funding institutions in their county. The results of the study showed that 17(5.6%) of

them strongly agreed, 164 (54.3%) agreed, 115(38.1%) were neutral, 4 (1.3%) disagreed and 2 (0.7%) strongly disagreed with the statement. The mean score was 3.63 above the sub composite mean of 3.45 hence this implies that residents supported the role played by the project funding institutions. A standard deviation of 0.643 obtained on this statement was less that the sub composite standard deviation of 0.772 hence the opinion converged.

Statement PFM5 was to establish whether enough funding was available at all times during project implementation. The results showed that 23 (1%) of the respondents agreed, 124 (41.1%) were neutral, 153 (50.7%) disagreed and 2 (0.7%) strongly disagreed with the statement. The mean score was 2.56 less than the sub composite mean of 2.9 and this implies that sufficient funding was not available during the project implementation. A standard deviation of 0.643 obtained was less than the sub composite standard deviation of 0.688 hence the opinion converged.

Statement PFM6 was to find out whether disbursement of funds was done on schedule. The results showed that 2 (0.7 %%) of the respondents strongly agreed, 22 (7.3%) agreed, 150(49.7%) were neutral, 122 (40.4%) disagreed and 6(2%) strongly disagreed with the statement. The mean score was 2.64 lower than the sub composite mean of 2.9 implying that residents were of the opinion that funds disbursement was not done on schedule. A standard deviation of 0.676 obtained was below the sub composite standard deviation of 0.688 hence the opinion converged.

Statement PFM7 was to establish whether the respondents think governments' initiative to partner with funding institutions has made connectivity faster than before. The results showed that 18(6%) of them strongly agreed, 146(48.3%) agreed, 114(37.7%) were neutral, 22 (7.3%) disagreed and 2(0.7%) strongly disagreed with the statement. A mean score of 3.52 obtained was higher than the sub composite mean of 2.9 implying that the residents were of the opinion that governments initiative to partner with the funding institutions made connectivity to be faster. A standard deviation of 0.746 obtained was above the sub composite standard deviation of 0.688 and thus could be concluded that the opinion diverged.

Statement PFM8 was to find out the extent to which the respondents were aware of the role played by the government and funding institutions in increasing energy investors in their counties. The results showed that 4 (1.3 %%) of them strongly agreed, 129 (42.7%) agreed, 141(46.7%) were neutral, 24 (7.9%) disagreed and 4(1.3%) strongly disagreed with the statement. The mean score was 3.35 below the sub composite mean of 3.50 hence this implies that the government did not create conducive environment for investors to invest in energy projects. A standard deviation of 0.702 obtained on this statement was less than the sub composite standard deviation of 0.824 and thus it can be concluded that the opinion converged.

Statement PFM9 was to see the respondents' awareness of the role of impact investors in their counties. The results showed that 19 (6.3 %%) of them strongly agreed, 78 (25.8%) agreed, 128(42.4%) were neutral, 69 (22.8%) disagreed and 8 (2.6%) strongly disagreed with the statement. The mean score was 3.1 less than the sub composite mean of 3.50 and this implies that the residents were not aware of the role played by the impact investors. A standard deviation was 0.915 recorded on this statement was higher that the sub composite standard deviation of 0.824 and therefore it can be concluded that opinion diverged.

Statement PFM10 the extent to which the respondents think if the government creates conducive environment, more investors will invest in energy projects in their areas. The study results showed that 100(33.1%) of them strongly agreed, 137(45.4%) agreed, 53(17.5%) were neutral, 8 (2.6%) disagreed and 4(1.3%) strongly disagreed with the statement. The mean score was 4.06 higher than the sub composite mean of 3.50 hence this implies that residents believed that if the government creates conducive environment then more investors will invest in energy projects. A standard deviation of 0.855 obtained was above the sub composite standard deviation of 0.824 hence the opinion diverged.

4.9.1 Descriptive Analysis of Project Fund Mobilization

Project Fund Mobilization was considered in terms of Attracting Private Investments, Leverage Funding and Attract Impact Investors. The results are as shown in Table 4.17:

Table 4.17: Mean and Standard Deviation of Project Fund Mobilization

Project Fund Mobilization	n	Mean (M)	Standard Deviation
Attracting Private Investments	302	3.45	0.798
Leverage Funding	302	2.9	0.800
Attract Impact Investors	302	3.50	0.778
Composite mean		**3.28**	

The results from Table 4.17 show that Attracting Private Investments seems to contribute to implementation of energy access projects to a moderate extent (M = 3.45, SD = 0.798), Leverage Funding to a neutral extent (M = 2.9, SD = 0.800) and Attract Impact Investors to a great extent (M = 3.50, SD = 0.778). This implies Attract Impact Investors is a vital consideration in the process of implementing energy access projects in the rural areas of the country.

To establish the direction and magnitude of the link between implementation of energy access projects and project fund mobilization a correlation analysis was conducted. Project fund mobilization is a composite of three indicators; attracting private investments, leverage funding and attract impact investors. The results are presented in Table 4.18:

Table 4.18: Correlation between Project Fund Mobilization and Implementation of Energy Access Projects

		Attracting Private Investments	Leverage Funding	Attract Impact Investors
Implementation of Energy Access Projects	**Pearson Correlation**	.209*	.349*	.165*
	Sig. (2-tailed)	0.000	0.000	0.004
	n	302	302	302

*. Correlation is significant at the 0.05 level (2-tailed)

From the results of Table 4.18, all the indicators of project fund mobilization are significantly positively correlated with implementation of energy access projects. The results from showed

a positive and statistically significant influence between attracting private investment and implementation of energy access ($r = 0.209^*$; $p<0.05$). Leverage funding on implementation of energy access also had a positive and statistically significant influence ($r = 0.349^*$; $p < 0.05$. Further, the influence of attracting impact investors on implementation of energy access was also positive and statistically significant ($r = 0.165^*$; $p < 0.05$). Thus, the results obtained in table 4.18 suggested that an increase in project fund mobilization strategy will lead to an increase in the implementation of energy access projects. Therefore, this study can draw the conclusion that project fund mobilization has a positive and statistical significant influence on implementation of energy access projects. As correlation however does not mean causality; therein a regression analysis was conducted to verify if there is a statistical relationship between the indicators of project fund mobilization and implementation of energy access projects. Further the researcher went ahead to evaluate the strength of the link between project fund mobilization and implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the third objective was tested:

Hypothesis 3

3.H_0: Project fund mobilization does not influence the implementation of rural energy access projects in underserved counties in Kenya.

Regression model

The following mathematical model was utilized to test the hypothesis.

$Y = f(X_3, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_3 X_3 + \boldsymbol{\varepsilon}$

Where

Y = Implementation of rural energy access projects

X_3= Project fund mobilization

β_o = Constant term

β_3 = Beta Coefficient

$\boldsymbol{\varepsilon}$ = Error term

The data was analyzed using the ordinary least square method and the results of the regression model are presented in Table 4.19:

Table 4.19: Project Fund Mobilization and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.385	0.148	0.139	3.526

a. Predictors: (Constant) AP, LF, AI

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	642.9	3	214.304	17.239	0.005
Residual	3704.6	298	12.431		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) AP, LF, AI

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	15.137	2.139		7.077	0.000
Attracting Private Investments	0.307	0.125	0.135	2.461	0.014
Leverage Funding	0.813	0.15	0.303	5.434	0.000
Attract Impact Investors	0.193	0.125	0.085	1.553	0.122

Dependent Variable: Implementation of Energy Access Projects

The standardized coefficients β value of the computed scores of attracting private investment was 0.135 with a t-test of 2.461 and at a significance level of p = 0.014 implying that for every 1 per cent increase in attracting private investment there was a predicted increase in the percentage of implementation of energy access of zero. Equally, the standardized regression coefficients β value of the computed scores of leverage funding was 0.303 with a t-test of 5.434 and at a significance level of p = 0.000. This implied that for every 1 per cent increase in leverage funding there was a predicted increase in the percentage of implementation of energy access of zero. Further, the standardized coefficients β value of the computed scores of attracting impact investors was 0.085 with a t-test of 1.553 and at a significance level of p = 0.122. Since the t-values are all greater than +1.96, the regression model obtained in table 4.19 was confirmed to be significant and feasible.

The model was further subjected to other goodness of best fit tests of coefficient of determination and test of the slope (β) as shown in Table 4.19. The results of the test of

coefficient of determination showed $R^2 = 0.148$ and r = 0.385, an indicator that generally project fund mobilization is moderately correlated with implementation of energy access projects. The $R^2 = 0.148$ was the coefficient of determination for this model and it depicted that project fund mobilization explained 14.8 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 85.2% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project fund mobilization that were not captured in this model. In terms of individual indicators of project fund mobilization, both attracting private investments and leverage funding are statistically significant at 5% level of significance, since for attracting private investments p = 0. 014<0.05 and for leverage funding p = 0.0<0.05.

Further, the β coefficient test degree of change in the outcome variable for every one-unit of change in the predictor variable of every individual predictor variable on the independent variable was carried out. The results as per Table 4.19 revealed that all the indicators apart from attracting impact investors 0.085, is not statistically significant at 10% (p = 0.122) level of significance or less. Attracting private investments beta coefficient of 0.135 is statistically significant at 10% (p = 0.014) implying there was a positive significant relationship between attracting private investments and implementation of energy access projects. The coefficient of leverage funding 0.303 is also statistically significant at 1% (p = 0.000) level of significance implying also that leverage funding had a very strong positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable leverage funding influenced more implementation of access projects more than attracting private investments.

The overall F statistic of F =17.239($p < 0.05$) is statistically significant since P = 0.000<0.05 hence the model at P = 0.000<0.05 was suitable to measure project fund mobilization. This was an indication that the link between project fund mobilization and implementation of rural energy access projects in the Kenya was statistically significant. Hence, the third null hypothesis that stated that: *3.H_0: Project fund mobilization did not influence the implementation of rural energy access projects in underserved counties in Kenya* was rejected.

This conclusion made by the study meant that that project fund mobilization had a significant influence on the implementation of rural energy access projects in underserved counties in Kenya.

The regression model arising from this analysis was as follows:

$Y = 15.137 + 0.307AP + 0.813LF + 0.193AI$

Where;

Y = Implementation of Energy Access Projects

AP = Attracting Private Investments

LF = Leverage Funding

AI = Attract Impact Investors

The findings were in concurrence with studies by Otieno *et al*., (2014) who claim that funding process is the most important aspect infrastructure projects without which projects might encounter financial difficulties. The Government of Kenya acknowledges that many forces will be required to distribute electricity to the rural areas. This study is further supported by Tomas *et al*., (2013) who note that the poor together with rural areas that are poor may not be able to raise the capital they require to meet their electricity needs. The current study established that the indicators of project fund mobilization are significantly positively correlated with implementation of energy access projects. In terms of magnitude, leverage funding is the highest with r = 0.349 followed by attracting private investments at r = 0.209 and then attract impact investors at r = 0.165. However, attracting impact investors was a vital consideration in the process of implementing energy access projects in rural areas in Kenya. The findings are further supported by those by Kaiser *et al*., (2010) who claim that in the absence of articulate funding processes contractors might be tempted to use poor quality raw materials and even result to unreliable suppliers, inefficient communication and delays in delivering projects.

4.10 Project Company and Implementation of Rural Energy Access Projects

Project companies play vital roles in the processes of executing energy access projects. To examine this, an analysis was done to evaluate the influence of Project company on implementation of rural energy access projects in underserved counties in Kenya. Project

company was measured in terms of single point of responsibility, contract price and innovation and service level agreements/warranty. To further analyze this, data was put in Likert scale then analyzed using mean and standard deviation. Data was further analyzed to establish the link between the two variables and to establish how the independent variable predicted the dependent variable. The Likert scale ranged from 5-Strongly Agree (SA), 4-Agree (AG), 3-Neutral (NE), 2-Disagree (DS), and 1-Strongly Disagree (SD). The results are as shown in Table 4.20.

Table 4.20: Descriptive Statistics of Project Company

	SA F (%)	**AG F (%)**	**NE F (%)**	**DS F (%)**	**SD F (%)**	**Mean**	**SD**	**Total F (%)**
Single Point of Responsibility								
IC1. Poor workmanship is evidenced by lack of qualified contractors	66 (21.9)	160 (53)	68 (22.5)	5 (1.7)	3 (1)	3.93	0.772	302 (100)
IC2. I am aware of the role of contractors in increasing speed of execution of projects in my area	78 (25.8)	154 (51)	46 (15.2)	15 (5)	9 (3)	3.92	0.935	302 (100)
IC3. I support the use of contractors in the implementation of projects in my county	89 (29.5)	153 (50.7)	48 (15.9)	9 (3)	3 (1)	4.05	0.814	302 (100)
Sub-Composite Mean and standard deviation						**3.97**	**0.840**	
Contract Price								
IC4. I did not experience projects disruption because of project cost overruns	3 (1)	34 (11.3)	134 (44.4)	123 (40.7)	8 (2.6)	2.67	0.748	302 (100)
IC5. Involving engineering,	49 (16.2)	153 (50.7)	81 (26.8)	10 (3.3)	9 (3)	3.74	0.875	302 (100)

procurement and contracting firms in execution phase of this project ensured projects are completed in time								
IC6. Am aware of the implications of the project company delaying the project in my county	9 (3)	108 (35.8)	129 (42.7)	52 (17.2)	4 (1.3)	3.22	0.81	302 (100)
IC7. Am aware of the timelines set for completion of energy access projects in my county	14 (4.6)	112 (37.1)	123 (40.7)	48 (15.9)	5 (1.7)	3.27	0.843	302 (100)
Sub-Composite Mean and standard deviation						**3.33**	**0.798**	
Service Level Agreements/Warranty								
IC8. Products for this project are provided with warranty	12 (4)	140 (46.4)	118 (39.1)	26 (8.6)	6 (2)	3.42	0.785	302 (100)
IC9. In case of a faulty product I know where to take the product for warranty claim	31 (10.3)	132 (43.7)	102 (33.8)	30 (9.9)	7 (2.3)	3.5	0.892	302 (100)
IC10. Am satisfied with the level of service offered by the project company in my county	83 (27.5)	154 (51)	51 (16.9)	6 (2)	8 (2.6)	3.99	0.874	302 (100)
Sub-Composite Mean and standard deviation						**3.63**	**0.850**	
Composite mean and standard deviation						**3.643**	**0.829**	

Table 4.20 shows the results from the analysis of project fund mobilization on implementation of energy access projects. A composite mean and standard deviation were computed whereby

mean and standard deviation were used for comparison. Statement IC1 was to establish whether the respondents think contractors used in the energy access projects were highly qualified. The results showed that 66 (21.9%) of them strongly agreed, 160 (53%) agreed, 68 (22.5%) were neutral, 5 (1.7%) disagreed and 3 (1%) strongly disagreed with the statement. The mean score was 3.93 below the sub composite mean of 3.97 hence implying that residents were of the opinion that contractors did not have qualified personnel during implementation. A standard deviation of 0.772 obtained was below the sub composite standard deviation of 0.840 hence the opinion converged.

Statement IC2 was to find out the extent to which the respondents were aware of the role of contractors in increasing speed of execution of projects in their areas. The results showed that 78 (25.8 %%) of the respondents strongly agreed, 154 (51%) agreed, 46 (15.2%) were neutral, 15 (5%) disagreed and 9 (3%) strongly disagreed with the statement. A mean score of 3.92 obtained was lower that the sub composite mean of 3.97 implying that residents were not aware of the role played by the contractors in increasing speed of execution. A standard deviation of 0.935 obtained on this statement was above the sub composite mean of 0.840 hence opinion diverged.

Statement IC3 was to find out whether the respondents support the use of contractors in the execution of projects in their counties. About 89(29.5%) of the respondents strongly agreed, 153 (50.7%) agreed, 48 (15.9%) were neutral, 9(3%) disagreed and 3 (1%) strongly disagreed with the statement. The mean score was 4.05 higher than the sub composite mean of 3.97 and this implied that the residents supported the use of contractors in implementation. A standard deviation of 0.814 obtained was below the sub composite standard deviation of 0.840 hence the opinion converged

Statement IC4 was to establish whether the respondents did not experience projects disruption because of project cost overruns. The results showed that 3 (1%) of them strongly agreed, 34 (11.3%) agreed, 134 (44.4%) were neutral, 123 (40.7%) disagreed and 8 (2.6%) strongly disagreed with the statement. The mean score was 2.67 below the sub composite mean of 3.33 hence this implies that residents experienced project disruptions because of cost overruns. A

standard deviation of 0.748 obtained was below the sub composite standard deviation of 0.798 hence implies the opinion converged.

Statement IC5 was to find out whether the respondents think involving engineering, procurement and contracting firms in execution phase of this project ensured projects completed as planned by the government. The study results showed that 49 (16.2%) of them strongly agreed, 153 (50.7%) agreed, 81(26.8%) were neutral, 10(3.3%) disagreed and 9(3%) strongly disagreed with the statement. The mean score was 3.74 above the sub composite mean of 3.33 and this implied that residents were of the opinion that involvement of EPC in implementation ensured timely completion of projects. A standard deviation of 0.875 obtained on this statement was higher than the sub composite standard deviation of 0.798 and therefore it can be concluded that the opinion diverged.

Statement IC6 was to find out whether the respondents are aware of the implications of the project company delaying the project in their counties. The results showed that 9(3%) of them strongly agreed, 108(35.8%) agreed, 129 (42.7%) were neutral, 52 (17.2%) disagreed and 4 (1.3%) strongly disagreed with the statement. A mean score of 3.22 obtained was lower than the sub composite mean of 3.33 implying that residents were not aware of the implications of project delays by the project company. A standard deviation of 0.843 obtained on this statement was above the sub composite standard deviation of 0.798 hence opinion diverged.

Statement IC7 evaluated whether the respondents were aware of the timelines set for completion of energy access projects in my county. The results showed that 14(4.6%) of them strongly agreed, 112(37.1%) agreed, 123(40.7%) were neutral, 48(15.9%) disagreed and 5(1.7%) strongly disagreed with the statement. The mean score was 3.27 less than the sub composite mean of 3.33 hence this implies that the residents were not aware of the timelines set for completion of projects in their localities. A standard deviation of 0.843 was obtained was higher than the sub composite standard deviation of 0.798 hence the opinion diverged.

Statement IC8 was to find out whether the respondents are aware that all products for this project are provided with warranty. The results showed that 12 (4%) of them strongly agreed,

140(46.4%) agreed, 118(39.1%) were neutral, 26(8.6%) disagreed and 6(2%) strongly disagreed with the statement. The mean score was 3.42 less than the sub composite mean of 3.63 and this implied that residents were not aware that products delivered under this project had warranty. A standard deviation of 0.785 obtained was below the sub composite standard deviation of 0.850 hence the opinion converged.

Statement IC9 was to see whether in case of a faulty product, if the respondents know where to take the product for warranty claim. The results showed that 31 (10.3%) of them strongly agreed, 132(43.7%) agreed, 102(33.8%) were neutral, 30 (9.9%) disagreed and 7 (2.3%) strongly disagreed with the statement. A mean score of 3.5 obtained was lower than the sub composite mean of 3.63 implying that residents were not aware of warranty claim process. A standard deviation of 0.892 obtained was above the sub composite standard deviation of 0.850 hence the opinion diverged.

Statement IC10 was to establish whether the respondents were satisfied with service level offered by the project company in their counties. The study results showed that 83(27.5%) of them strongly agreed, 154 (51%) agreed, 51(16.9%) were neutral, 6 (2%) disagreed and 8 (2.6%) strongly disagreed with the statement. The mean score was 3.99 higher than the sub composite mean of 3.63 and this implies that residents were satisfied with the services offered by the project company. A standard deviation of 0.874 obtained on this statement was higher than the sub composite standard deviation of 0.850 and therefore it can be concluded that the opinion diverged. Therefore, the residents agreed that service level agreements/warranty were an important variable in explaining rural energy access projects in underserved counties in Kenya.

4.10.1 Descriptive Analysis of Project Company

Project company was considered in terms of single point of responsibility, contract price and service level agreements/warranty. The results are as shown in Table 4.21:

Table 4.21: Mean and Standard Deviation for Project Company

Project Company	n	Mean (M)	Standard Deviation
Single Point of responsibility	302	3.64	0.800
Contract Price	302	3.33	0.798
Service Level Agreements/warranty	302	3.96	0.778
Composite mean		**3.64**	

Table 4.21 show that single point of responsibility contributes to implementation of energy access projects to a great extent (M = 3.64, SD = 0.800), contract price to a neutral extent (M = 3.33, SD = 0.798) and service level agreements/warranty to a great extent (M = 3.96, SD = 0.778). This implies both single point of responsibility and service level agreements/warranty are vital variables when implementing energy access projects in rural areas of Kenya. The overall composite mean shows project company is an important explanatory variable for implementation of the rural energy projects. A correlation analysis was conducted to establish the direction and magnitude of the relationship between implementation of energy access projects and project company. Project company is a composite of three indicators; single point of responsibility, contract price and service level agreements/warranty. The results are presented in Table 4.22:

Table 4.22: Correlation between Project Company and Implementation of Energy Access Projects

		Single Point of responsibility	Contract Price	Service Level Agreements/warranty
Implementation of Energy Access Projects	**Pearson Correlation**	0.014	0.016	0.056
	Sig. (2-tailed)	0.802	0.782	0.33
	n	302	302	302

*. Correlation is significant at the 0.05 level (2-tailed)

Results in table 4.22 indicated that the association between project company strategies and the implementation of energy access is positive and statistically insignificant. For instance, the correlation with single point of responsibility had, $r = 0.014$ at $p < 0.05$, with contract price, $r = 0.016$, at p-value < 0.05, and finally with service level agreement/warranty, the $r = 0.056$, at $p < 0.05$ respectively. Table 4.22 findings thus depicts that none of the indicators of project company were significantly correlated with implementation of energy access project, since all their p values were bigger than 0.1. As correlation does not usually mean causality, a regression analysis was conducted to verify if there is a statistical relationship between the indicators of project company and implementation of energy access projects. Further the researcher went ahead to establish the strength of relationship between project company and implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the fourth objective was tested:

Hypothesis 4

4.H_0: Project company does not influence the implementation of rural energy access projects in underserved counties in Kenya.

Regression model

The following mathematical model was used to test the null hypothesis.

$Y = f(X_4, \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_4 X_4 + \boldsymbol{\varepsilon}$

Where

Y = Implementation of rural energy access projects

X_4 = Project Company

β_o = Constant term

β_4 = Beta Coefficient

$\boldsymbol{\varepsilon}$ = Error term

The data was analyzed using the ordinary least square method and the results of the regression model are presented in Table 4.23:

Table 4.23: Project Company and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.058	0.003	-0.007	3.813

a. Predictors: (Constant) SP, CP, SLA

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	14.6	3	4.879	0.336	0.05
Residual	4332.9	298	14.540		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) SP, CP, SLA

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	27.189	1.978		13.749	0
Single Point of responsibility	-0.027	0.128	-0.014	-0.211	0.833
Contract Price	0.021	0.122	0.01	0.172	0.863
Service Level Agreements/warranty	0.125	0.132	0.061	0.946	0.345

Dependent Variable: Implementation of Energy Access Projects

The standardized coefficients β value of the computed scores of contract price was 0.01 with a t-test of 0.172 and at a significance level of p = 0.863 implying that for every 1 per cent increase in contract price there was a predicted increase in the percentage of implementation of energy access of zero. Equally, the standardized regression coefficients β value of the computed scores of service level agreement was 0.061 with a t-test of 0.946 and at a significance level of p = 0.345. This implied that for every 1 per cent increase in service level agreement there was a predicted increase in the percentage of implementation of energy access of zero. However, the standardized coefficients β value of the computed scores of scope of project activities was negative 0.014 with a t-test of negative 0.211 and at a significance level of p = 0.833. The results of this variable can be concluded that, the regression model obtained in table 4.23 is confirmed to be insignificant and feasible.

The results in Table 4.23 were further analyzed for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model. The outcome was that the test of coefficient of determination $R^2 = 0.003$ and r = 0.058, an indicator that, an indicator that generally project company is not correlated with implementation of energy access projects. The $R^2 = 0.003$ was the coefficient of determination for this model and it depicted that project company explained 0.3 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 99.7% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project company that were not captured in this model. In terms of individual indicators of project company, none is statistically significant, implying none of the individual variables of project company significantly explain implementation of energy access projects in the rural areas of Kenya.

The β coefficient test of the degree of change in the outcome variable for every one-unit of change in the predictor variable predictor variable on the independent variable was carried out. The results as per Table 4.23 on the nature of the relationship between the individual variables using the Beta coefficients depicted that all the indicators apart from single point of responsibility with 0.014(inverse), are statistically significant at p = 0.833. Contract price Beta coefficient of 0.01 is statistically significant at p = 0.863 implying there is a positive significant relationship between contract price and implementation of energy access projects. The coefficient service level agreement/warranty 0.061 is also statistically significant at p = 0.345 implying also that service level agreement/warranty has a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable service level agreement/warrant seem to influence implementation of access projects more than contract price.

In terms of the composite indicator of project company, the overall F statistic of F=0.336($p < 0.05$), is not statistically significant since $P = 0.800 > 0.05$ hence the model at $P=0.000<0.05$ was not suitable to measure project company. This was an indication that the relationship between project company and implementation of rural energy access projects in underserved counties in Kenya was not statistically significant. Hence, the fourth null hypothesis that stated

that: *4.H_0: Project company did not influence the implementation of rural energy access projects in underserved counties in Kenya* was retained. This conclusion made by the study meant that project company has no notable influence on the implementation of rural energy access projects in underserved counties in Kenya.

With the help of the results, the regression model arising from this analysis was as follows:

Y = 27.189 - 0.027SP + 0.021CP + 0.125SLA

Where;

Y = Implementation of Energy Access Projects

SP = Single Point of Responsibility

CP = Contract Price

SLA = Service Level Agreements/Warranty

4.11 Combined Rural Electrification Expansion and Implementation of Rural Energy Access Projects

Combined rural electrification expansion strategy is a vital element in the execution of energy access projects. To examine this, an analysis was done to investigate the combined influence rural electrification expansion strategies on the implementation of energy access projects in underserved counties in Kenya. Data was further analyzed to establish the link between the two variables and to establish the extent to which combined rural electrification predicted the implementation of rural energy access projects.

Hypothesis 5

5.H_0: Combined rural electrification expansion does not influence the implementation of rural energy access projects in underserved counties in Kenya.

The following mathematical model was utilized to test the null hypothesis:

Implementation of Energy Access Projects = f (Project Planning, Project Service Outsourcing, Project Fund Mobilization, Project Company)

$Y = f(X_1, X_2, X_3, X_4, \varepsilon)$

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

β_0= Constant term

$\beta_1,\beta_2,\beta_3,\beta_4$ = Beta coefficients and ε = Error term

For the fifth hypothesis model, data was analyzed using ordinary least square method and the results of the regression model are presented in Table 4.24:

Table 4.24: Combined Rural Electrification Expansion Strategies and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.372	0.139	0.127	3.551

b. Predictors: (Constant) X_1, X_2, X_3, X_4

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	602.3	3	150.582	11.942	0.05
Residual	3745.2	298	12.610		
Total	4347.5	301			

c. Dependent Variable: Implementation of Energy Access Projects

d. Predictors: (Constant) X_1, X_2, X_3, X_4

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	13.636	2.714		5.024	0.000
Project planning	0.082	0.066	0.077	1.235	0.218
Project service Outsourcing	0.091	0.063	0.097	1.443	0.150
Project fund mobilization	0.356	0.071	0.300	4.983	0.000
Project company	-0.070	0.056	-0.084	-1.410	0.160

Dependent Variable: Implementation of Energy Access Projects

The results in Table 4.24 were further analyzed by the researcher for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model and the outcome depicted that predictor variables had a positive influence on implementation of energy access projects apart from project company. In terms of significance, project fund mobilization and the constant term are the ones which are statistically significance at 0.05, since their p-values are less than 0.05. The R^2 test of best fit revealed that project planning, project service outsourcing, project fund mobilization and project company taken together explained 13.9 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 86.1% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than combined rural electrification expansion strategies that were not considered in this model. The r value of 0.372 implies that there is a relatively weak correlation between combined rural electrification expansion and implementation of energy access projects.

From Table 4.24, it was revealed that subjection of the individual predictors to test the degree of change in the outcome variable for every one-unit of change in the predictor variable had diverse outcome. Beta coefficients values indicate project fund mobilization had the strong influence at $\beta = 0.300$ followed by project service outsourcing with $\beta = 0.097$, then project planning with $\beta = 0.077$ and lastly project company 0.084(inverse). For instance, with a one unit change in project company, it led to statistically insignificant change of 0.084 (inverse) with a ($p = 0.160$) in implementation of energy access projects in underserved counties in Kenya. A unit change in project planning led to statistically insignificant adjustment of 0.077($p = 0.218$) in implementation of energy access projects in underserved counties in Kenya. On the other hand, a unit variance in project service outsourcing resulted to a proportionate change of 0.097($p = 0.150$) in implementation of energy access projects in underserved counties in Kenya statistically insignificant. Lastly, project fund mobilization was also subjected to best of fit test of the coefficient whereby a unit change in project fund mobilization resulted to a 0.300 change in implementation of energy access projects in underserved counties in Kenya ($p = 0.000$) led to a moderate proportionate change amounting to 0.300($p = 0.000$) in implementation of energy access projects in underserved counties in Kenya and the alteration was statistically significant. In conclusion, the only variable which seem to be statistically

significant in explaining implementation of energy access projects is project fund mobilization whose standardized beta coefficient 0.300 is statistically significant at 1% (p = 0.000) level of significance. Project service outsourcing is only significant at 15% (p = 0.150) level of significance and project company is significant at 16% level of significance, the least in order is project planning which is significant at 22% (p = 0.218) level of significance. The standard criteria for checking significance was at 10%, implying the three variables are not statistically important factors explaining implementation of energy access projects when combined together.

The F-statistic of 11.942($p < 0.05$) is nonetheless statistically significant since $p = 0.000<0.05$, and therefore appropriate estimators of the implementation of energy access projects in underserved counties in Kenya. This implied all the variables in unison are statistically important explanatory variables to implementation of energy access projects. For this reason, the study rejected the fifth null hypothesis*: 5.H_0: Combined rural electrification expansion does not influence the implementation of rural energy access projects in underserved counties in Kenya.* This implied that there was statistically significant combined influence of combined rural electrification expansion on the implementation of rural energy access projects in underserved counties in Kenya.

With the help of the results in Table 4.24, the regression equation formed was as follows;

can be re-written as:

$$Y = 13.636 + 0.082X_1 + 0.091X_2 + 0.356X_3 - 0.070X_4$$

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

4.12 Project Control Mechanisms and Implementation of Energy Access Projects

Project control mechanisms also plays a vital role in the implementation of energy access projects and its influence was thereby evaluated. Project service outsourcing was measured in

terms: Planning and standardization of project control mechanisms, engineering design and operation and maintenance. To further analyze this, data was put in Likert scale then analyzed descriptively and inferentially. The Likert scale ranged from 5-Strongly Agree (SA), 4-Agree (AG), 3-Neutral (NE), 2-Disagree (DS), and 1-Strongly Disagree (SD). The results are in Table 4.25.

Table 4.25: Descriptive Statistics of Project Control Mechanisms

Statements	**SA F (%)**	**AG F (%)**	**NE F (%)**	**DS F (%)**	**SD F (%)**	**Mean**	**SD**	**Total F (%)**
Planning and Standardization								
PC1. I was involved in initiating project control mechanisms during implementation of this project	13 (4.3)	54 (17.9)	124 (41.1)	93 (30.8)	18 (6)	3.16	0.935	302 (100)
PC2. Implementation of energy access depends entirely on proper planning	8 (2.6)	20 (6.6)	112 (37.1)	123 (40.7)	39 (12.9)	3.55	0.895	302 (100)
PC3. I am aware that standardization ensures many people in my county can afford energy access projects	4 (1.3)	41 (13.6)	116 (38.4)	120 (39.7)	21 (7)	3.37	0.852	302 (100)
PC4. Am satisfied with the support given by the service providers in ensuring the project meets the required standards	8 (2.6)	33 (10.9)	124 (41.1)	119 (39.4)	18 (6)	3.35	0.853	302 (100)
Sub-Composite Mean and standard deviation						**3.36**	**0.884**	
Engineering Design								

PC5. I was trained how to install and operate the equipment implemented in the project	10 (3.3)	54 (17.9)	119 (39.4)	107 (35.4)	12 (4)	3.19	0.89	302 (100)
PC6. Due to properly designed works, repeat jobs have tremendously reduced	7 (2.3)	50 (16.6)	147 (48.7)	84 (27.8)	14 (4.6)	3.16	0.836	302 (100)
PC7. I was involved in determining the product that best suits people in my county	7 (2.3)	86 (28.5)	119 (39.4)	81 (26.8)	9 (3)	3	0.876	302 (100)
Sub-Composite Mean and standard deviation						**3.12**	**0.867**	
Operation and Maintenance								
PC8. I am aware of operation and maintenance schedules	5 (1.7)	38 (12.6)	127 (42.1)	117 (38.7)	15 (5)	3.33	0.82	302 (100)
PC9. In case of a problem, how fast is the service restored back	7 (2.3)	98 (32.5)	127 (42.1)	62 (20.5)	8 (2.6)	2.89	0.847	302 (100)
PC10. Am satisfied with the level of maintenance given to us	13 (4.3)	68 (22.5)	120 (39.7)	93 (30.8)	8 (2.6)	3.05	0.901	302 (100)
Sub-Composite Mean and standard deviation						**3.09**	**0.856**	
Composite mean and standard deviation						**3.19**	**0.869**	

Table 4.25 shows the results from the analysis of project fund mobilization on implementation of energy access projects. A composite mean and standard deviation were computed whereby mean and standard deviation were used for comparison. Statements PC1 evaluated the extent

to which the respondents were involved in initiating project control mechanisms during implementation of this project. The results showed that 18 (6%) of them strongly agreed, 93 (30.8%) agreed, 124 (41.1%) were neutral, 54 (17.9%) disagreed and 13 (4.3%) strongly disagreed with the statements. The mean score was 3.16 less than the sub composite mean of 3.36 hence this implies that the residents were not involved in initiating project control mechanisms during implementation. A standard deviation of 0.935 obtained on this statement was higher than the sub composite standard deviation of 0.884 and therefore it can be concluded that the opinion diverged.

Statements PC2 was to find out whether the respondents think effective planning enhanced the execution of energy access projects in their areas. The results showed that 39 (12.9%) of them strongly agreed, 123 (40.7%) agreed, 112(37.1%) were neutral, 20(6.6%) disagreed and 8 (2.6%) strongly disagreed with the statement. A mean score of 3.55 obtained was higher than the sub composite mean of 3.36 implying that proper planning enhanced implementation of energy access projects. A standard deviation of 0.895 obtained was higher that the sub composite mean of 0.884 and hence the opinion diverged.

Statements PC3 was to find out whether the respondents were aware that standardization ensures many people in their counties can afford energy access projects. The results showed that 21(7%) of them strongly agreed, 120 (39.7%) agreed, 116 (38.4%) were neutral, 41 (13.6%) disagreed and 4 (1.3%) strongly disagreed with the statement. The mean score was 3.37 slightly higher than the sub composite mean of 3.36 and this implied that the residents were aware that standardization was important in ensuring that the residents could afford access to energy. A standard deviation of 0.852 obtained was lower than the sib composite standard deviation of .0884 and hence opinion converged.

Statements PC4 sought to find if the respondents were satisfied with the support given by the service providers in ensuring the project meets the required standards. The study results showed that 18 (6%) of them strongly agreed, 119 (39.4%) agreed, 124(41.1%) were neutral, 33(10.9%) disagreed and 8 (2.6%) strongly disagreed with the statement. A mean score of 3.35 obtained was slightly lower than the sub composite mean of 3.36 implying that residents were

not satisfied with the support of the service providers. A standard deviation of 0.853 obtained was below the sub composite standard deviation of 0.884 hence the opinion converged.

Statements PC5 was to establish whether the respondents were trained on how to install and operate the equipment implemented in the project. The study results showed that 12 (4%) of them strongly agreed, 107 (35.4%) agreed, 119 (39.4%) were neutral, 54(17.9%) disagreed and 10(3.3%) strongly disagreed with the statement. The mean score was 3.19 higher than the sub composite mean of 3.12 implying that training was offered to residents on the installation and operation of equipment during implementation. A standard deviation of 0.89 obtained was higher than the sub composite standard deviation of 0.867 hence the opinion diverged.

Statements PC6 was to find out whether all approved designs were to the required specification. The results showed that 14(4.6%) of them strongly agreed, 84(27.8%) agreed, 147(48.7%) were neutral, 50(16.6%) disagreed and 7(2.3%) strongly disagreed with the statement. The mean score was 3.16 higher than the sub composite mean of 3.12 and this implied that residents noted that the required specifications were met. A standard deviation of 0.836 obtained on this statement was lower than the sub composite standard deviation of 0.867 hence the opinion converged.

Statements PC7 was to establish whether were involved in determining the product that best suits people in their counties. The results showed that 29(3%) of the respondents strongly agreed, 81(26.8%) agreed, 119(39.4%) were neutral, 86(28.5%) disagreed and 7(2.3%) strongly disagreed with the statement. The mean score was 3 less than the sub composite mean of 3.12 and this implies that the residents were not involved in determining products suitable for their regions. A standard deviation of 0.876 was higher than the sub composite standard deviation of 0.867 and therefore it can be concluded that the opinion diverged.

Statements PC8 was to find out whether the respondents were aware of operation and maintenance schedules available. The results showed that 15(5%) of them strongly agreed, 117 (38.7%) agreed, 127(42.1%) were neutral, 38(12.6%) disagreed and 5(1.7%) strongly disagreed with the statement. A mean score of 3.33 obtained was higher than the sub composite

mean of 3.09 implying that residents were aware of the operation and maintenance schedules. A standard deviation of 0.82 obtained was less than the sub composite standard deviation of 0.856 hence the opinion converged.

Statements PC9 was to verify in case of a problem, how fast is the service restored back. The results showed that 8 (2.6%) of them strongly agreed, 62(20.5%) agreed, 127(42.1%) were neutral, 98(32.5%) disagreed and 7(2.3%) strongly disagreed with the statement. The mean score was 2.89 which was less than the sub composite mean of 3.09 hence this implied that residents were not satisfied with the service restoration in case of a problem. A standard deviation of 0.847 obtained was less than the sub composite standard deviation of 0.856 hence the opinion converged.

Statements PC10 was to establish whether the respondents were satisfied with the level of maintenance given to them. The study results showed that 8(2.6%) of them strongly agreed, 93(30.8%) agreed, 120(39.7%) were neutral, 68(22.5%) disagreed and 13(4.3%) strongly disagreed with the statement. The mean score was 3.05 less than the sub composite mean of 3.09 hence this implied that the residents were not satisfied with the level of maintenance offered to them. A standard deviation of 0.901obtained on this statement was higher than the sub composite standard deviation of 0.856 and therefore it can be concluded that the opinion diverged.

4.12.1 Descriptive Statistics of Project Control Mechanism

Project control mechanism was evaluated in terms of scope of planning and standardization, engineering design and operation and maintenance. Their results are as provided in Table 4.26:

Table 4.26: Mean and Standard Deviation of Project Control Mechanism

Project Control Mechanisms	n	Mean (M)	Standard Deviation
Planning and Standardization	302	3.36	0.884
Engineering Design	302	3.12	0.867
Operation and Maintenance	302	3.09	0.856
Composite mean		**3.19**	

Table 4.26 shows that on average all the indicators of project control mechanism have a neutral influence on implementation of energy access projects. The overall composite mean also shows project control mechanism has a neutral influence on implementing energy access projects in underserved counties in Kenya. A correlation analysis was conducted to establish the direction and magnitude of the link between implementation of energy access projects and project control mechanism. Project control mechanism is a composite of three indicators; planning and standardization, engineering design and innovation and operation and maintenance. The results are as presented in Table 4.27:

Table 4.27: Correlation between Project Control Mechanisms and Implementation of Energy Access Projects

		Planning and standardization	Engineering design	Operation and maintenance
Implementation of Energy Access Projects	**Pearson Correlation**	.202*	.213*	.147*
	Sig. (2-tailed)	0	0	0.05
	N	302	302	302

*. Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed)

From the results of Table 4.27, all the indicators of project control mechanism strategy are significantly and positively correlated with implementation of energy access projects. The results from showed a positive and statistically significant influence between planning and standardization and implementation of energy access ($r = 0.202^*$; $p < 0.05$). Engineering design on implementation of energy access also had a positive and statistically significant influence ($r = 0.213^*$; $p < 0.05$. Further, the influence of operation and maintenance on implementation of energy access was also positive and statistically significant ($r = 0.147^*$; $p < 0.05$). Thus, the results obtained in table 4.27 suggested that an increase in project control mechanism strategy is an important predictor of implementation of energy access. Therefore, this study can draw the conclusion that project control mechanism has a positive and statistical significant influence on implementation of energy access projects. Notably however, all the correlations are weak. As correlation does not mean causality, a regression analysis was

conducted to verify if there was a statistical link between the indicators of project control mechanisms and implementation of energy access projects. Further the researcher established the strength of the link between project control mechanisms and implementation of energy access projects in underserved counties in Kenya and thus the following hypothesis which was in line with the sixth objective was tested:

Hypothesis 6

6.H_0: Project control mechanisms does not influence the implementation of rural energy access projects in underserved counties in Kenya.

Regression model

The following mathematical model was utilized to test the null hypothesis.

$Y = f(X_{6,} \boldsymbol{\varepsilon})$

$Y = \beta_o + \beta_6 X_{6+} \boldsymbol{\varepsilon}$

Where; Y = Implementation of rural energy access projects; X_6= Project control mechanisms

β_o = Constant term; β_6 = Beta Coefficient and $\boldsymbol{\varepsilon}$ = Error term

Data was analyzed using the ordinary least square method and the results of the regression model are presented in Table 4.28:

Table 4.28: Project Control Mechanism and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.255	0.065	0.056	3.693

a. Predictors: (Constant) PS, ED, OM

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	282.2	3	94.072	6.896	0.000
Residual	4065.3	298	13.642		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) PS, ED, OM

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	21.92	1.517		14.449	0
Planning and standardization	0.214	0.102	0.13	2.106	0.036
Engineering Design	0.277	0.125	0.141	2.213	0.028
Operation and maintenance	0.121	0.128	0.058	0.949	0.343

Dependent Variable: Implementation of Energy Access Projects

The standardized coefficients β value of the computed scores of planning and standardization was 0.13 with a t-test of 2.106 and at a significance level of p = 0.036 implying that for every 1 per cent increase in planning and standardization there was a predicted increase in the percentage of implementation of energy access of zero. Equally, the standardized regression coefficients β value of the computed scores of engineering design was 0.141 with a t-test of 2.213 and at a significance level of p = 0.028. This implied that for every 1 per cent increase in engineering design there was a predicted increase in the percentage of implementation of energy access of zero. Further, the standardized coefficients β value of the computed scores of operation and maintenance was 0.058 with a t-test of 0.949 and at a significance level of p = 0.343. The results of this variable can be concluded that, the regression model obtained in table 4.28 is confirmed to be significant and feasible.

The results in Table 4.28 were further analyzed for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model. The outcome was that the test of coefficient of determination $R^2 = 0.065$ and r = 0.255, an indicator that generally project control mechanisms is weakly correlated with implementation of energy access projects. The $R^2 = 0.065$ was the coefficient of determination for this model and it depicted that project control mechanisms explained 6.5 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 93.6% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than project control mechanisms that were not considered in this model. In terms of individual indicators of project control mechanism, both planning and standardization and engineering design are statistically significant at 5% level of significance, since for planning and standardization $p = 0.036<0.05$ and for engineering design $p = 0.028<0.05$.

The β coefficient test on the significance of every individual predictor variable on the independent variable was carried out. The results as per Table 4.28 depicted that all the indicators apart from operation and maintenance 0.058, was not statistically significant at 10% (p = 0.343). Planning and standardization beta coefficient of 0.13 was statistically significant at 10% (p = 0.036) implying there was a positive significant relationship between planning and standardization and implementation of energy access projects. The coefficient of engineering design variable 0.141 was also statistically significant at 10% (p = 0.028) implying also that engineering design has a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable engineering design seem to influence implementation of access projects more than planning and standardization.

In terms of the composite indicator of project control mechanism, the overall F statistic of $F=6.896(p < 0.05)$ was statistically significant since $P = 0.000<0.05$. This was an indication of statistically significant relationship between project control mechanism and implementation of rural energy access projects in the Kenya. Therefore, the sixth null hypothesis that stated that: *6.H_0: Project control mechanisms does not influence the implementation of rural energy access projects in underserved counties in Kenya* was rejected and concluded that project control had

a notable influence on the implementation of rural energy access projects in underserved counties in Kenya.

The regression model arising from this analysis was as follows:

$Y = 21.92 + 0.214PS + 0.277ED + 0.121OM$

Where;

Y = Implementation of Energy Access Projects

PS = Planning and Standardization

ED = Engineering Design

OM = Operation and Maintenance

The results in Table 4.28 were in concurrence with those by Martinsuo and Killen (2014) that identified the critical role that project control mechanisms play in supervising the way project is executed to ensure that it complies with desired specifications and standards set for projects supported by rural electrification framework. The study is further supported by Robinson and Carrillo, (2005) who identified performance management models as important in rural electrification projects because they helped in continuous improvement and developing innovative solutions. The results of the current study showed on average all the indicators of project control mechanism had an influence on the implementation of energy access projects.

The findings were further supported by Jackson (2004) who established development of project plan, identification of performance deviations, evaluation of corrective options, the process of making adjustments where needed, result evaluation and performance monitoring as fundamental steps within project control cycle. Accordingly, for project control measures to perform optimally, there is need to understand the need for the following: data collection and documentation, information utilized in control processes, organizational business processes, reporting systems, skills required in control processes among other things. The current study therefore determined that project control mechanisms influences implementation of energy access projects in underserved counties in Kenya.

4.12.2 Combined Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

Project control mechanism plays key role of moderating the influence of the relationship between rural electrification expansion strategies and the implementation of rural energy access projects. To examine this, an analysis was done to evaluate the influence of project control mechanisms on the link between rural electrification expansion strategies and the implementation of rural energy access projects in underserved counties in Kenya. In order to establish the strength of relationship, the researcher conducted a multiple regression incorporating the combined rural electrification expansion strategies together with project control mechanism variable.

Hypothesis 7

7.H_0: The strength of relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya does not depend on project control mechanisms. The following model was utilized to test the null hypothesis:

Implementation of Energy Access Projects = f (Project Planning, Project Service Outsourcing, Project Fund Mobilization, Project Company, Project Control Mechanisms)

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$

Where:

Y = Implementation of Energy Access Projects

X_1 = Project Planning

X_2 = Project Service Outsourcing

X_3 = Project Fund Mobilization

X_4 = Project Company

X_5 = Project Control Mechanisms

β_0 = Constant term

$\beta_1, \ldots \beta_5$ = Beta coefficients

ε = Error term

Step One: Influence of Rural Electrification Expansion Strategies on Implementation of Energy Access Projects.

In the first step, the independent variable rural electrification expansion strategies were regressed on implementation of energy access projects. The results of step one of the regression model are as presented in Table 4.29:

Table 4.29: Rural Electrification Expansion Strategies and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.372	0.139	0.127	3.551

Predictors: (Constant) X1, X2, X3, X4

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	602.3	3	150.582	11.942	0.05
Residual	3745.2	298	12.610		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) X_1, X_2, X_3, X_4

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	13.636	2.714		5.024	0.000
Project planning	0.082	0.066	0.077	1.235	0.218
Project service Outsourcing	0.091	0.063	0.097	1.443	0.150
Project fund mobilization	0.356	0.071	0.300	4.983	0.000
Project company	-0.070	0.056	-0.084	-1.410	0.160

Dependent Variable: Implementation of Energy Access Projects

The results in Table 4.29 were further analyzed by the researcher for goodness of fit and tests of coefficient of determination and test of the slope (β) were performed on the model and the outcome depicted that all predictor variables had a positive influence on implementation of

energy access projects apart from project company. In terms of significance, project fund mobilization and the constant term are the ones which are statistically significance at 0.05, since their p-values are less than 0.05. The R^2 test of best fit revealed that project planning, project service outsourcing, project fund mobilization and project company taken together explained 13.9 % of variations in implementation of energy access projects in underserved counties in Kenya. The remaining 86.1% of variations in implementation of energy access projects in underserved counties remained unexplained and were explained by other variables other than combined rural electrification expansion strategies that were not considered in this model. The r value of 0.372 implies that there is a relatively weak correlation between combined rural electrification expansion and implementation of energy access projects.

From Table 4.29, it was revealed that subjection of the individual predictors to test the degree of change in the outcome variable for every one-unit of change in the predictor variable had diverse outcome. Beta coefficients values indicated project fund mobilization had the strong influence at $\beta = 0.300$ followed by project service outsourcing with $\beta = 0.097$, then project planning with $\beta = 0.077$ and lastly project company 0.084(inverse). For instance, with a one unit change in project company, it led to statistically insignificant change of 0.084 (inverse) with a ($p = 0.160$) in implementation of energy access projects in underserved counties in Kenya. A unit change in project planning led to statistically insignificant adjustment of 0.077 ($p = 0.218$) in implementation of energy access projects in underserved counties in Kenya. On the other hand, a unit variance in project service outsourcing resulted to a proportionate change of 0.097(p=.150) in implementation of energy access projects in underserved counties in Kenya statistically insignificant.

Lastly, project fund mobilization was also subjected to test the degree of change in the outcome variable for every one-unit of change in the predictor variable had diverse outcome whereby a unit change in project fund mobilization resulted to a 0.300 change in in implementation of energy access projects in underserved counties in Kenya ($p = 0.000$) led to a moderate proportionate change amounting to 0.300($p = 0.000$) in implementation of energy access projects in underserved counties in Kenya and the alteration was statistically significant. In conclusion, the only variable which seem to be statistically significant in explaining

implementation of energy access projects is project fund mobilization whose standardized beta coefficient 0.300 is statistically significant at 1% (p = 0.000). Project service outsourcing is only significant at 15% (p = 0.150) and project company is significant at 16% level of significance, the least in order is project planning which is significant at 22% (p = 0.218) level of significance. The standard criteria for checking significance is at 10%, implying the three variables are not statistically important factors explaining implementation of energy access projects when combined together.

The F-statistic of 11.942($p < 0.05$) is nonetheless statistically significant since $p=0.000<0.05$, and therefore appropriate estimators of the implementation of energy access projects in underserved counties in Kenya. This implied all the variables in unison are statistically important explanatory variables to implementation of energy access projects. This implied that there was statistically significant combined influence of combined rural electrification expansion on the implementation of rural energy access projects in underserved counties in Kenya.

The regression model arising from this analysis was as follows:

$Y = 13.636 + 0.082X_1 + 0.091X_2 + 0.356X_3 - 0.070X_4$

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

Step Two: Influence of Rural Electrification Expansion Strategies and Project Control Mechanisms on Implementation of Energy Access Projects

In the second step, the influence of project control mechanism that acted as the moderator was introduced into the model between rural electrification expansion strategies and implementation of energy access projects. The results are as presented in Table 4.30:

Table 4.30: Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

Model Summary

Model	R	R square	Adjusted R Square	Std. Error of the Estimate
	0.377	0.142	0.128	3.549

a. Predictors: (Constant) X_1, X_2, X_3, X_4, X_5

ANOVA

Model	Sum of squares	Df	Mean Square	F	
Regression	618.6	5	123.726	9.821	0.000
Residual	3728.9	296	12.5980		
Total	4347.5	301			

a. Dependent Variable: Implementation of Energy Access Projects
b. Predictors: (Constant) X_1, X_2, X_3, X_4, X_5

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	14.128	2.747		5.143	0.000
Project planning	0.051	0.071	0.049	0.721	0471
Project service Outsourcing	0.084	0.063	0.090	1.330	0.185
Project fund mobilization	0.326	0.076	0.275	4.283	0.000
Project company	-0.091	0.056	-0.097	-1.601	0.110
Project Control Mechanisms	0.068	0.057	0.082	1.137	0.256

Dependent Variable: Implementation of Energy Access Projects

From Table 4.30, the F statistic of F = 9.821(p = 0.000) is statistically significant since p = 0.000<0.05 implying the predictor variables are all important in explaining the execution of energy access projects. In terms of comparison with the results of Table 4.24 where the researcher analyzed the combined rural electrification expansion strategies alone, there are a positive change which are contributed by project control mechanisms. Particularly, the correlation coefficient, increased from 37.2% to 37.7%, the R^2 increases from 13.9% to 14.2%, which is an improvement of 0.3%. However small the magnitude was, it implied that project control mechanism influences the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya. This

model depicted mixed outcome whereby the predictor variable was statistically significant in the presence of the interaction term which implied that partial moderation had occurred. In conclusion, this implied that project control mechanisms moderated the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya. Hence, the study rejected the seventh null hypothesis which states that*: 7.H_0: The strength of relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya does not depend on project control mechanisms.* Therefore, project control mechanism moderated the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya.

From Table 4.30, the regression model arising from this analysis was as follows:

$Y = 14.128 + 0.051X_1 + 0.084X_2 + 0.326X_3 - 0.091X4 + 0.068X_5$

Where:

Y= Implementation of Energy Access Projects

X_1= Project Planning

X_2= Project Service Outsourcing

X_3= Project Fund Mobilization

X_4= Project Company

X_5= Project Control Mechanism

In summary the test of hypotheses in this study are as presented in Table 4.31:

Table 4.31: Summary of Hypothesis Testing - Results

Objective	Hypothesis	Results	Resulting Model	Conclusion
To examine the extent to which project planning influence implementation of rural energy access projects in underserved counties in Kenya	Project planning does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya	$R^2 = 0.042$ F = 4.399 P = 0.000<0.05	Y = 21.401 + 0.2PF + 0.243BC + 0.204IE	reject the null hypothesis
To establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya,	Project service outsourcing does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.	$R^2 = 0.064$ F = 6.842 P = 0.000<0.05	Y = 22.403 - 0.103SP + 0.344TC + 0.297DB	reject the null hypothesis
To establish the extent to which project fund mobilization influence the implementation of rural energy access projects in underserved counties in Kenya,	Project fund mobilization does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya	$R^2 = 0.148$ F = 17.239 P=0.000<0.05	Y = 15.137 + 0.307AP + 0.813LF + 0.193AI	reject the null hypothesis
To examine the extent to which project company influence the implementation of rural energy access projects in underserved counties in Kenya,	Project company does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.	$R^2 = 0.003$ F = 0.336 P = 0.800>0.05	27.189 - 0.027SP + 0.021CP + 0.125SLA	Fail to reject the null hypothesis

To establish the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya,	Combined rural electrification expansion does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya	$R^2 = 0.139$ $F = 11.942$ $P = 0.000<0.05$	$Y = 13.636 + 0.082X_1 + 0.091X_2 + 0.356X_3 - 0.070X_4$	reject the null hypothesis
To establish the extent to which project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya	Project control mechanisms does not significantly influence the implementation of rural energy access projects in underserved counties in Kenya.	$R^2 = 0.065$ $F = 6.896$ $P = 0.000<0.05$	$Y = 21.92 + 0.214PS + 0.277ED + 0.121OM$	reject the null hypothesis
To establish the extent to which project control mechanisms influences the relationship between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in Kenya	The strength of the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya does not depend on project control mechanisms.	$R^2 = 0.142$ $F = 9.821$ $P = 0.000<0.05$	$Y = 14.128 + 0.051X_1 + 0.084X_2 + 0.326X_3 - 0.091X4 + 0.068X_5$	reject the null hypothesis

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarized the findings of both descriptive and inferential statistics based on the study objectives as outlined in chapter one. The chapter makes conclusions on key findings in view of the observations and decisions outlined in previous studies. Furthermore, recommendations were made in relation to the objectives, tested hypotheses and outcomes of this study and highlighting recommendations that policy makers might adopt in their lines of duties. In addition, suggestions for further areas of study to help expand or make a review of the current research study were highlighted. Finally, this chapter ended with the contributions of the study to the body of knowledge.

5.2 Summary of Findings

The section starts by summarizing the findings based on thematic areas drawn identified from study's objectives. Overall, the study evaluated the moderating influence of project control mechanisms on the link between rural electrification expansion strategies and implementation of energy access projects among rural households in underserved counties in Kenya. Seven objectives and hypotheses were developed to achieve the study's purpose. Furthermore, a questionnaire that was developed in line with study's objectives was developed and utilized to collect data from respondents whereas observation and in-depth interviews were also utilized to obtain qualitative data. Finally, regression was utilized to test the hypotheses.

5.2.1 Project Planning and Implementation of Energy Access Projects

The first objective evaluated the influence of project planning on the execution of rural energy access projects in underserved counties in Kenya. The null hypothesis presumed that project planning did not influence the implementation of those projects. Project planning was estimated using three indicators, namely; policy formulation, building capacity and integrating energy access. The results were $F = 4.399 (p < 0.05)$, $P = 0.000 < 0.05$, $r = 0.206$, $R^2 = 0.042$. The study findings revealed that all the indicators apart from integrating energy access projects 0.084, are not statistically significant at 10% ($p = 0.157$). Policy formulation Beta coefficient

of 0.101 is statistically significant at 10% (p = 0.093) implying a positive relationship between policy formulation and implementation of energy access projects that was significant. The coefficient building capacity 0.112 is also statistically significant at 10% (p = 0.072) implying also that building capacity has a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable building capacity seem to influence implementation of access projects more than policy formulation. Though there was a positive weak correlation, the F statistic was however statistically significant thus the null hypothesis was rejected and was concluded that project planning influences the implementation of rural energy access projects in underserved counties in Kenya.

Although project planning in overall had a weak positive correlation and influenced implementation of energy access project in underserved counties in Kenya $F = 4.399(p < 0.05)$, $P = 0.000<0.05$, $r = 0.206$, $R^2 = 0.042$, the contribution of this variable should not be ignored by the decision makers for some of the components such as policy formulation and building capacity can significantly streamline regulations and develop incentives that stimulate market for new energy access, attract financing and private enterprises into the sector and in the end change positively the implementation. Furthermore, policy consistency and clarity are vital in the successful execution of projects because they facilitate a stable market for energy from SMEs, eliminate barriers that hinder innovative business models and attract investment from private sector, which is sustainable. Again those other aspects which were insignificant can be improved by revising the specific comments made by respondents which portrayed a weak opinion and further investigate the causes of weak support and hence correct.

5.2.2 Project Service Outsourcing and Implementation of Energy Access Projects

The second objective evaluated the influence of project service outsourcing on the implementation of rural energy access projects in underserved counties in Kenya. The null hypothesis presumed that project service outsourcing did not influence the implementation of rural energy access projects in underserved counties in Kenya. Project service outsourcing was estimated using three indicators, namely; scope of project activities, technology customization and innovation and development of business models. The results were $F = 6.842(p < 0.05)$, $P = 0.000<0.05$, $r = 0.254$, $R^2 = 0.064$. The findings revealed that that all the indicators apart

from scope of project activities -0.043, were not statistically significant at 10% ($p = 0.477$). Technology customization and innovation Beta coefficient of 0.157 is statistically significant at 10% ($p = 0.015$) implying that there was a positive relationship between technology customization and innovation and implementation of energy access projects that was significant. The coefficient of development of business models 0.159 is also statistically significant at 10% ($p = 0.012$) implying also that development of business models had a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable development of business models seems to influence implementation of access projects more than technology customization and innovation. Though there was a positive weak correlation, the F statistic was statistically significant and as such the null hypothesis was rejected. It was then concluded that project service outsourcing significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

Although as per F Statistic $F = 6.842 (p < 0.05)$, $P = 0.000 < 0.05$, of the model of project service outsourcing demonstrated a significant estimation of performance at 95% confidence level, it was not conclusive that all the individual components significantly influence implementation of energy access project in underserved counties in Kenya. However, further hypothesis test results depicted that only one out of the three aspects of project service outsourcing had insignificant influence on implementation of energy access project in underserved counties in Kenya. The contribution of this variable should not be ignored by the decision makers for some of the components such as technology customization and development of business models can significantly enable local firms to benefit from external expertise, mitigate risks and manage costs so that they can utilize existing resources on other important aspects of their core operations. Optimization of a technology is critical in the process of scaling up of energy projects. Considering the rural settings of developing countries, it becomes necessary for entrepreneurs and energy companies to innovate technologies that are more user-friendly.

5.2.3 Project Fund Mobilization and Implementation of Energy Access Projects

The third objective evaluated the influence of project fund mobilization on the implementation of rural energy access projects in underserved counties in Kenya. The null hypothesis presumed that project fund mobilization did not influence the implementation of rural energy access projects in underserved counties in Kenya. Project fund mobilization was estimated using three indicators, namely; attracting private investments, leverage funding and attract private investments. The results were $F = 17.239$, $P = 0.000<0.05$, $r = 0.385$, $R^2 = 0.148$. The findings revealed that all the indicators apart from attracting impact investors 0.085, were not statistically significant at 10% ($p = 0.122$). Attracting private investments beta coefficient of 0.135 is statistically significant at 10% ($p = 0.014$) implying there was a positive relationship between attracting private investments and implementation of energy access projects that was significant. The coefficient of leverage funding 0.303 is also statistically significant at 1% ($p = 0.000$) level of significance implying also that leverage funding had a very strong positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable leverage funding influenced more implementation of access projects more than attracting private investments. The study findings had a relatively stronger positive correlation, and the F statistic was also statistically significant an implication that the null hypothesis was rejected. Consequently, it was concluded that project fund mobilization significantly influences the implementation of rural energy access projects in underserved counties in Kenya.

Project fund mobilization had a moderate positive correlation with implementation of energy access projects. The management needs to uphold all project fund mobilization aspects by ensuring that there were clear funding processes within the execution of energy access projects. Lack of a clear and systematically structured funding process may result to financial difficulties, wrong designation and acquisition of wrong human resources that may in long run encourage contractors to use low quality materials, unreliable suppliers, delays in project delivery and inefficient communication. This implied that the management cannot ignore the project fund mobilization strategy in the organization for it can propel the rate at which business transformation take place in terms of attracting private investments and leverage funding and execution of energy access projects in underserved counties in Kenya.

5.2.4 Project Company and Implementation of Energy Access Projects

The fourth objective evaluated the influence of project company on the implementation of rural energy access projects in underserved counties in Kenya. The null hypothesis presumed that project company did not influence the implementation of those projects. Project company was estimated using three indicators, namely; single point of responsibility, contract price and service level agreement/warranty. The results were $F = 0.336(p < 0.05)$, $P = 0.800>0.05$, $r = 0.058$, $R^2 = 0.003$. The findings revealed that all the indicators apart from single point of responsibility with 0.014(inverse), are statistically significant at $p = 0.833$. Contract price Beta coefficient of 0.01 is statistically significant at $p = 0.863$ implying there was a positive relationship between contract price and implementation of energy access projects that was significant. The coefficient service level agreement/warranty 0.061 is also statistically significant at $p = 0.345$ implying also that service level agreement/warranty has a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable service level agreement/warrant seem to influence implementation of access projects more than contract price.

Although project company strategy in overall insignificantly influenced implementation $F = 0.336(p < 0.05)$, at 95% confidence level, the contribution of this variable should not be ignored by the implementing agencies for some of the components such as service level agreement/warranty and contract price can significantly influence the implementation. Again those other aspects which were insignificant can be improved by revising the specific comments made by respondents which portrayed a weak opinion and further investigate the causes of weak support and hence correct. The management further need to be advised that this position does not imply that all the aspects of project company are non-functional for identification of areas of improvement may increase the impact this variable will have on implementation. This is due to the fact that to enhance the performance of project company, contractors are normally advised to focus much of their attention on maintaining stable workforce, establish links with sub-contractors, reduce delays and make better use of time. Also, they are advised to identify insufficient communication, adhere to mutual goals, empower staff members, and involve contractors at an early stage.

5.2.5 Combined Rural Electrification Expansion and Implementation of Energy Access Projects

The fifth objective evaluated the combined influence of rural electrification expansion effort on the implementation of rural energy access projects in underserved counties in Kenya. The null hypothesis presumed that the combined rural electrification expansion effort did not influence the implementation of rural energy access projects in underserved counties in Kenya. Combined rural electrification strategies were estimated using the four independent variables, namely; project planning, project service outsourcing, project fund mobilization and Project Company. The results were $F = 11.942$, $p = 0.000<0.05$, $r = 0.372$, $R^2 = 0.139$. The findings indicated that project fund mobilization had the strong influence at $\beta = 0.300$ followed by project service outsourcing with $\beta = 0.097$, then project planning with $\beta = 0.077$ and lastly project company 0.084(inverse). For instance, with a one unit change in project company, it led to statistically insignificant change of 0.084 (inverse) with a ($p = 0.160$) in implementation of energy access projects in underserved counties in Kenya. It was then concluded that combined rural electrification expansion significantly influence the implementation of rural energy access projects in underserved counties in Kenya.

Under this fifth objective, the results showed that when individual components of rural electrification expansion are regressed independently against implementation, majority of them (that is, project planning, project service outsourcing, project fund mobilization and project company) depicted statistically significant lower results unlike in a case where they are regressed jointly to determine implementation. The implication arising from such an analysis is that for establishment of an effective rural electrification, the management of energy access projects in underserved counties in Kenya should always consider all the components of rural electrification expansion which will lead to improvement in implementation. Otherwise discriminative reliance on some of the elements of rural electrification expansion would adversely affect the implementation of energy access project.

5.2.6 Project Control Mechanisms and Implementation of Energy Access Projects

The sixth objective evaluated the influence of project control mechanisms on the implementation of rural energy access projects in underserved counties in Kenya. The null

hypothesis tested was project control mechanisms does not influence the implementation of rural energy access projects in underserved counties in Kenya. Project control mechanisms were estimated using three indicators, namely; planning and standardization, engineering design and operation and maintenance. The results were $F = 6.896$, $p = 0.000<0.05$, $r = 0.255$, $R^2 = 0.065$. The findings revealed that depicted that all the indicators apart from operation and maintenance 0.058, was not statistically significant at 10% ($p = 0.343$). Planning and standardization beta coefficient of 0.13 was statistically significant at 10% ($p = 0.036$) implying there was a positive relationship between planning and standardization and implementation of energy access projects that was significant. The coefficient of engineering design variable 0.141 was also statistically significant at 10% ($p = 0.028$) implying also that engineering design has a positive statistically significant influence on implementation of energy access projects. In terms of the comparison the variable engineering design seem to influence implementation of access projects more than planning and standardization.

The correlation was weak, but the overall F statistic of $F = 6.896(p < 0.05)$ was statistically significant since $p = 0.000<0.05$. Descriptive findings showed that all aspects of project control mechanisms were given high proportions of acceptance from the respondents with the lowest mean rate of agreement being recorded at 3.09. However, hypothesis test results contradicted this outcome. This could be due to external factors not captured in this model which adversely influenced project control mechanisms. The management needs to investigate the causes of such dissimilarities and adjust accordingly. This is necessary since the control mechanisms provide moderation to rural electrification strategies in line with policies aimed at protecting service providers and consumers and on the basis of bilateral agreements signed between project developers and rural electrification agencies. The project control mechanisms monitor projects as they develop to ensure that they comply with desired specifications and standards for projects that are supported by rural electrification framework. Further the management needs to uphold all project control mechanisms aspects so that Rural Electrification Authority's that monitor and supervise relevant projects make sure that they meet technical and safety standards, they use quality materials, designs and they use network equipment and are reasonably cost effective.

5.2.7 Combined Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects

The seventh objective evaluated the influence of project control mechanisms on the link between rural electrification expansion strategies and the implementation of energy access projects in underserved counties in Kenya. The study found that project fund mobilization had the strong influence at $\beta = 0.300$ followed by project service outsourcing with $\beta = 0.097$, then project planning with $\beta = 0.077$ and lastly project company 0.084 (inverse). For instance, with a one unit change in project company, it led to statistically insignificant change of 0.084 (inverse) with a ($p = 0.160$) in implementation of energy access projects in underserved counties in the country. The null hypothesis tested was the strength of the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya does not depend on project control mechanisms. The overall results were $F = 9.821$, $p = 0.000<0.05$, $r = 0.377$, $R^2 = 0.142$, Adjusted $R^2 = 0.128$. On introduction of project control mechanism to the model, there were various changes, particularly, the correlation coefficient, increased from 0.372 to 0.377, the R^2 increased from 13.9% to 14.2%, which is an improvement of 0.3%. However small the magnitude was, it still implied that project control mechanism influenced the relationship between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya, thus the null hypothesis was rejected. It was then concluded that the strength of the link between rural electrification expansion strategies and implementation of energy access projects in underserved counties in the country depended on project control mechanisms.

In conclusion, project control mechanisms in overall, had a moderating influence in the association between rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya. This implied that the management cannot ignore the introduction of project control mechanisms in implementing organizations for it can accelerate the rate at which access to energy reach is realized. Further the moderating influence of project control mechanisms in project execution is important because it transforms policies and objectives of a project into well-coordinated activities, helps in allocating resources and making sure that they are utilized in the right way, and makes sure that tasks are executed in

the right way to achieve project goals which in the long run will positively influence implementation of energy access projects in underserved counties in Kenya.

5.3 Conclusions

The research findings linked to the seven specific objectives and the corresponding hypotheses were diverse. The outcome for each hypothesis was analyzed and conclusion made. The first research objective examined the influence of project planning on the implementation of rural energy access projects in underserved counties in Kenya. These indicators included policy formulation, building capacity and integrating energy access with development programs. The findings identified policy formulation as the dominant indicator, followed by building capacity and lastly by integrating energy access with development programs. This implies policy formulation is a vital consideration in the process of implementing energy access projects in the Kenyan rural areas. Nonetheless, the uptake of these indicators (building capacity, integrating energy access with development programs and policy formulation) by various companies in the country could be brought about by some of the challenges that respondents highlighted: lack of proper knowledge by the locals, lack of coordination between rural electrification authority and the private firms in the area, lack of public participation, poor training skills and language barriers. This implies that energy access stakeholders should come up with project planning strategies in terms of policy formulation, building capacity and integrating energy access with development programs. There is therefore, need to develop clear project planning strategies in order to accelerate rural electrification in underserved counties.

The second objective evaluate the influence of project service outsourcing on the implementation of rural energy access projects in underserved counties in Kenya. Project service outsourcing was evaluated in terms of scope of project activities, technology customization and innovation and development of business models that were identified from previous studies and included in the questionnaire. The findings showed that scope of project activities as the dominant indicator followed by development of business models and then technology customization and innovation. This implies scope of project activities is vital when implementing energy access projects in rural areas of Kenya.

The findings could be elaborated by the reasons that respondents identified: Familiarity with the models used lacked, technology used was not very familiar hence difficult for locals, to understand, limited capacity to handle projects, technology used in some products was not easy to understand, no participation in determining the model suitable for us and lack of understanding, a few people still under power access. The other views on challenges were generally based on costs; lack of business knowledge, risks relating to occupational health and safety, technology being used is not up to date and delays in project implementation. From the challenges given, the same respondents were requested to recommend possible ways to handle the challenges of enforcing project service outsourcing strategy. The responses ranged from education and training of the locals to a suggestion of using easy models that the locals can understand. This implied that the respondents agreed that project service outsourcing is important for implementation of projects in the rural areas; however, they are of the view that the technology being used is not easily understood by the locals and as such more training is needed so as to enhance cooperation between these firms and the locals when executing these tasks. It can thus be concluded that the majority of the respondents in rural electrification felt that project service outsourcing influenced the implementation of energy access projects in underserved counties in Kenya. It was therefore concluded that project service outsourcing strategy should address scope of project activities, technology customization and innovation and development of business models in their projects since it would positively influence the implementation of their projects.

The third objective evaluated the influence of project fund mobilization on the implementation of rural energy access projects in underserved counties in Kenya. Project fund mobilization was measured in terms of attracting private investments; leverage funding, attract impact investors and once again, these variables were identified from previous studies and included in the questionnaire. The findings identified the aspect of attracting impact investors as the most dominant indicator, followed by attracting private investments and then leverage funding. This implies attracting impact investors is a vital consideration in the process of executing energy access projects in the country. This could be elaborated by the reasons that respondents identified: inadequate funding, very few investors, funding was not available, fund disbursement was slow; there is need for more investors. Some were of the view that vices of

corruption and bribery were a challenge in project fund mobilization, their sentiments were: poor distribution of funds, bribery of available funds, Corruption, misuse of public funds, inadequate strategic and operational plans, accountability and transparency, political interference. Accordingly, it could be concluded that project fund mobilization strategy faces a lot of challenges that need to be addressed as majorly suggested by the respondents by having an increase in the levels of funding and an attraction of more investors to the sector so the full potential of implementation of energy access projects can be achieved. As a result, it could be concluded that there exists a positive influence of project fund mobilization on implementation of energy access projects in underserved counties in the country; hence, the need to engage institutions that could fund those projects in strategy formulation.

The fourth objective evaluated the extent to which project company influenced the implementation of rural energy access projects in underserved counties in Kenya. Project company was measured in terms of single point of responsibility, contract price and innovation and service level agreements/warranty and were informed by previous studies; thus, were included in the questionnaire. Results from descriptive statistics indicated that service level agreements/warranty as the dominant indicator, followed by single point of responsibility and then contract price. This implies both single point of responsibility and service level agreements/warranty are vital variables when implementing energy access projects in rural areas of Kenya. The overall composite mean shows project company is an important explanatory variable for implementation of the rural energy projects. Some of the key information noted from the respondents revolved in majority of the respondents noting the aspect of awareness and delays of the projects. Most of the respondents were of the view that they were not aware about the timelines and roles of the company. Some of the sentiments were: role of contractors and government projects was not told to us, project delays; project timelines were not shared to us, some households took longer to be connected and There was no public awareness campaign, I am not aware if all products are provided. It was thus concluded that project company as a strategy, the main concern from the respondents was the levels of awareness about the timelines and responsibilities of the companies.

Likewise, there was concern of coordination of companies and the locals, seems there was a probable wedge between the companies and the locals. Some of the possible solutions suggested by the respondents are a creation of a central point for the companies and an increment in the number of companies. The inferential statistics indicated no statistical link between project company and implementation of rural energy access projects in the country. Due to this, the study failed to reject the null hypothesis that was being tested and concluded that project company has no notable influence on the implementation of rural energy access projects in underserved counties in Kenya.

The fifth objective evaluated the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya. The combined rural electrification expansion included project planning, project service outsourcing, project fund mobilization and project company. The results indicated that all the predictor variables had a positive influence on implementation of energy access projects apart from project company. As a result, it was summed up that combined rural electrification expansion strategies had positive influence on the implementation of energy access projects in underserved counties in Kenya.

The sixth objective evaluated the extent to which project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya. Project control mechanisms were evaluated in terms of planning and standardization of project control mechanisms, engineering design and operation and maintenance that were identified from previous studies and included in the questionnaire. Descriptive statistics indicated that planning and standardization was the dominant indicator followed by engineering design and then operation and maintenance. The overall composite mean also showed project control mechanism had a neutral influence on implementing energy access projects in rural areas of Kenya. This could be elaborated by the reasons that respondents provided: maintenance delay, besides not shared in time, long time taken to implement, staff buying time during implementation, cases of bribery during implementation, the implementation process is very slow, those involved in implementation are not strict, no uniformity and no proper planning, the whole process is slow, inappropriate resources. Overall conclusion is that project control

mechanism strategy had a positive influence on the implementation of energy access projects in underserved counties in Kenya.

Research hypothesis seven of the study sought to find out the extent to which project control mechanisms moderated the relationship between rural electrification expansion strategies and the implementation of rural energy access projects in underserved counties in Kenya. The combined rural electrification strategies included project planning, project service outsourcing, project fund mobilization and project company. Accordingly, it was concluded that project control mechanisms played notable roles in the implementation of energy access projects; an attribute that should be emphasized in all energy access projects. Project managers in energy access projects should thereby embrace practices that involve planning and standardization, engineering design and operation and maintenance of project control mechanisms as it has been proven by this research that it would improve overall implementation of energy access projects.

5.4 Recommendations of the Study

In underserved counties in Kenya, most of the rural areas can be difficult to access because they are remote. Therefore, it would be relevant to develop supporting infrastructures in the electrification of those regions. Some of the supporting infrastructure may include the skills that local technicians require to execute their mandates effectively especially in operating and maintaining electrification systems. This part of the study recommends some of the measures that would be taken to improve electrification of those areas based on the study's findings.

5.4.1 Recommendation for Policy

The link between both the National and County government and other players including private institutions at local level is a big hindrance to rural electrification policies in the underserved counties in Kenya. One unique thing about such projects is that the most successful ones are the ones that support job creation at local level because they generate income for the local people. Such projects are able to promote education among the local people. In line with the national constitution that advocates for devolution of essential services to local people, the findings from the current study have several implications to county governments and the

people who offer services to those governments and local people. The findings were that a notable influence between rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved counties in Kenya. This implies rural electrification companies need to strengthen their strategies in order to realize increased implementation of energy access projects. The study identified community participation, project planning, workshops, technicians, institutionalization, county governments, network development, project management and support from stakeholders as the most influential factors in the execution of energy access and penetration in rural underserved counties in Kenya.

The study findings also indicated that project fund mobilization had an influence on the implementation of rural energy access projects in underserved counties in Kenya. The recommendation from the study findings was a creation of a favorable environment which can attract levels of funding and more investors to the sector.

The study recommends that electricity connection fee among the rural areas especially the remote ones should be subsidized. This may extend to the cost of wiring materials used at domestic houses and unit cost of electricity. It also recommends that service providers should reduce aggregate losses to acceptable levels so that rural electrification projects can be implemented to the underserved counties in the country. It further recommends that sufficient funding that should be disbursed on timely manner should be allocated to those areas so that it can be easy to implement the off grid extension. In this respect, it would be necessary to identify additional funders. Besides, the government should develop innovative ways of financing such projects to help people to connect to electricity. This is in relation to the fact that most of the underserved areas in the country do not have vibrant credit sector. Accordingly, the process of providing credit to those people would be critical in meeting costs linked to electrification.

The study recommends that the government should offer subsidies to electricity applicants who form groups. In so doing, it acknowledges the fact that an increase in electricity uptake is able to reduce the cost of various utilities that companies use to connect households to electricity

and even transport those materials. Accordingly, it is possible to develop cheaper distribution networks. In this respect, the rural electrification exercise should make use of existing resources to benefit from economies of scale. Nonetheless, the exercise of encouraging people to connect to electricity as a group faces a collective challenge that needs to be addressed through policies developed by government.

5.4.2 Recommendation for Practice

Project planning was identified to have a notable influence on the implementation of rural energy access projects in underserved counties in Kenya. Accordingly, this implies that energy access companies should embrace policy formulation, building capacity and integrating energy access with development programs for them to improve the process of executing rural energy access projects in underserved counties in Kenya and also to enhance satisfaction of all stakeholders.

The current study was driven by local concerns. As a result, the choice of projects in those areas should reflect local opportunities implying that it should be developed to serve local needs. The implication is that the members of staff who would be appointed to run energy access projects should thereby assess the use of fund in those projects, the manner of implementing those projects and even evaluate the impact of those projects on local people so that their sustainability can be guaranteed. Another important thing would be to ensure that the local communities should be involved in the daily operation of those projects whether in form of cooperatives or other forms to encourage those people support those projects.

Both National and County governments should subsidize mass connection programs. This is in relation to the fact that the low electricity connection in those areas obviously shows that connection fee is relatively high for local communities. It should be noted that any expansion exercise is critical to those areas because it brings resources to local people. Accordingly, the local people should be empowered to connect to electricity by lowering the connection fee.
Moreover, community participation should be embraced by all stakeholders because it would be critical for various reasons such as those that seek to promote shared responsibility among local people and those that own projects, which most of the time tend to be government

agencies or private enterprises and even the members of the community who use or manage those energy projects.

5.5 Suggestions for Further Research

The current study evaluated the influence of rural electrification expansion strategies on implementation of energy access projects among rural households in underserved counties in Kenya. In addition, it evaluated the moderating influence. The study was guided by seven specific objectives with corresponding hypotheses. In this respect, it would be necessary for further studies to be conducted to evaluate the way contextual factors such as those relating to government policy and project control mechanisms moderate the link between rural electrification expansion strategies and implementation of energy access projects in the underserved counties in Kenya. The study did meet the seven specific objectives hence some research gaps were identified which formed areas of further research as follows:

This study established that project company indicators had insignificant influence on the implementation of energy access projects in underserved counties. However, the individual components of project company activities considered in isolation depicted mixed results. That is, service level agreement had significant influence while single point of responsibility and contract price had insignificant influence on performance respectively hence further research is needed on whether the continuous reviews on project company activities is vital to establish the extent to which these indicators have an influence on implementation of energy access in underserved counties in Kenya.

From the interviews and observations done, it was clear that all those involved in the implementation of projects had a wide understanding of the importance of rural electrification expansion strategies as a means of achieving project implementation, but the actual influence of specific rural electrification expansion related factors need to be studied to focus not only on energy sector but also as well as in other development sectors.

The study also recommends that similar studies should be carried out to cover other counties in the country as well as developing countries to evaluate whether similar results would be

obtained or they would change slightly. Studies should also identify the merits of the rural electrification strategies utilized in the underserved counties in Kenya and even evaluate the preference of those strategies including their effectiveness across the energy access sector.

5.6 Contributions of the Study to Knowledge

This study contributes to the literature in many ways which can be grouped according to the methodological and theoretical contributions. This study is unique in the methodology adopted in terms of the assessment of the interaction of various rural electrification expansion strategies and how they have been linked to the implementation of energy access through the moderation of project control mechanisms in underserved counties in Kenya. Similarly, the study encompassed a combinations of data collection, analysis and procedures which provides a methodological contribution in the field of energy access through an investigation of the influence of rural electrification expansion strategies on implementation of energy access. Furthermore, the inclusion of both descriptive and regression analyses to investigate the moderating influence of moderating the influence of the relationship between rural electrification expansion strategies and the implementation of rural energy access projects. and use of SPSS to generate data for energy bodies in Kenya, provided a key contribution and generation of new knowledge for effective strategic planning and management of the rural electrification expansion strategies in various counties.

This study has established that rural electrification expansion strategies influence implementation of energy access projects. Literature reviewed has identified varied factors that influence implementation of energy access projects in different parts of the world. Most studies focused on the barriers to rural electrification which encompass cost, quality and schedule majorly for construction and general rural development projects. Taking the theoretical approaches of these studies, this study has tested them empirically using opinions from government technocrats, funding institutions, private sector contractors and respondents in various underserved counties. In reference to the study variables and methodology this study may be first of its kind to show this kind of relationship in underserved counties in Kenya especially in the energy sector in underserved counties. Literature reviewed did not establish any other empirical study done on the influence of rural electrification expansion strategies on

implementation of energy access projects as moderated by project control mechanisms. This study has provided an insight beyond the focus on barriers by looking at other factors that contribute to good project implementation, which traditionally are not usually taken as performance factors.

In terms of knowledge, this study contributes to the knowledge in several grounds. First, it validates the complete structure of rural electrification in the Kenyan context. Secondly, it focuses on rural electrification expansion strategies and implementation of energy access in underserved counties in Kenya, as opposed to the dimensions of rural electrification as mentioned in many other studies. Thirdly, it fills the knowledge gap by using project control mechanism as a moderator on the relationship between the predictor and the predicted variables used. A key element of successful implementation of energy access projects is through having an effective project control mechanism. The study's contributions to existing literature is as shown in Table 5.1

Table 5.1: Contributions of the Study to Knowledge

Objective	Findings	Conclusion	Contributionto Knowledge
1. To examine the extent to which project planning influence implementation of rural energy access projects in underserved counties in Kenya	Project planning has an influence on the implementation of rural energy access projects in underserved counties in Kenya	Policy Formulation, building capacity and integrating energy access with development programs have a statistically significant influence on the implementation of rural energy access projects in underserved counties in Kenya	Tomas, T., & Sanchez, T. (2013) confirmed through their studies that economic poverty and lack of political will caused low energy access to rural households. This study examined the extent to which project planning influenced implementation of rural energy access. Thus the study has found out that despite economic poverty and lack of political will, the use of proper project planning strategy would greatly influence the implementation of energy access projects in underserved counties in Kenya as demonstrated with empirical evidence of the study.
2. To establish the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya	Project service outsourcing has an influence on the implementation of rural energy access projects in underserved counties in Kenya	Scope of project Activities, Technology customization and innovation and Development of business models have a statistically significant influence on the implementation of rural energy access projects in underserved counties in Kenya	Mills, (2014) pointed out that that reliable business models can create local distribution channels and support services in energy sector which further creates local ownership and jobsand economic development in areas they serve. This study further established the extent to which project service outsourcing influence implementation of rural energy access projects in underserved counties in Kenya. It established that other than business models, project service outsourcing brings with it expanded scope of project activities and a further technology customization and Innovation as evidenced by the empirical findings of this study

3. To establish the extent to which project fund mobilization influence the implementation of rural energy access projects in underserved counties in Kenya	Project fund mobilization has an influence on the implementation of rural energy access projects in underserved counties in Kenya	Attracting Private investment, Leverage Funding and Attract Impact Investors have a statistically significant influence on the implementation of rural energy access projects in underserved counties in Kenya	Zhang & Kumar (2011) found out through their studies that lack of funds and proper education as the primary factors affecting rural electrification. However, their studies failed to show how these factors link with other factors such as the willingness of people to pay by the rural population. This Study established the extent to which project fund mobilization influence the implementation of rural energy access projects. Thus the study found out that despite funding, creating an enabling environment that attracts private investments and impact investors can greatly influence the implementation of energy access projects in underserved counties in Kenya
4. To examine the extent to which project company influence the implementation of rural energy access projects in underserved counties in Kenya,	Project company has no influence on the implementation of rural energy access projects in underserved counties in Kenya	Single Point of responsibility, Contract Price and service Level Agreements/ Warranty have no statistical significance on the implementation of rural energy access projects in underserved counties in Kenya	Gloria T., William E., Siegfriedt W. E., Carstens A., (2011). In their study findings they indicated that in order to improve implementation of energy projects, the project company should focus on construction time, reduced delays, maintain stable workforce and establish partnerships with contractors. The current study examined the extent to which project company influence the implementation of rural energy access projects in underserved counties in Kenya. The study findings demonstrated no empirical evidence that project company strategy greatly influences the implementation of

			energy access projects in underserved counties in Kenya
5. To establish the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya	Combined rural electrification expansion has an influence on the implementation of rural energy access projects in underserved counties in Kenya	Combined rural electrification expansion have a statistically significant influence on the implementation of rural energy access projects in underserved counties in Kenya	Desjardins, S., Richard G, Pradeep P, & Chris W., (2014). In their studies found out that there is need to have a strategy and framework that unites all the major players in the energy sector and recommended that the poor can afford and maintain sustainable technologies and that social enterprise such as rural electrification can be run as commercial businesses. The current study established the extent to which combined rural electrification expansion influence the implementation of rural energy access projects in underserved counties in Kenya The study empirically established that Combined rural electrification expansion strategy greatly influences the implementation of energy access projects in underserved counties in Kenya
6. To establish the extent to which project control mechanisms influence the implementation of rural energy access projects in underserved counties in Kenya	Project control mechanisms has an influence on the implementation of rural energy access projects in underserved counties in Kenya	Planning & Standardization, Engineering Design and Operation and Maintenance have a statistically significant influence on the implementation of rural energy access projects in underserved counties in Kenya	Martinsuo and Killen, (2014) in their study findings noted that rural electrification projects require a framework that meets minimum safety and technical standards, quality and appropriate design to have a positive influence on implementation of projects. It is evident that despite identifying minimum standards to be met by project control mechanisms the study did not go further into assessing relationship of planning and operation

			and maintenance on the implementation of those projects. Thus the study found out that Planning & Standardization, Engineering Design and Operation and Maintenance greatly significant influence the implementation of rural energy access projects in underserved counties in Kenya as empirically evidenced by the study findings
7. To establish the extent to which project control mechanisms influences the relationship between Rural electrification expansion strategies and the implementation of energy access projects in underserved counties in Kenya	Project Control mechanisms has a moderating influence on the relationship between combined rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya	Project Control mechanisms is very important as it moderates the relationship between combined rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya	Florence and Wan, (2013) in their study established that there is need to have an integration between organizational strategies and methodologies that give rise to better implementation of projects. However, despite identifying a relationship between project control mechanisms and strategies, the study did not go further into assessing relationship on the implementation of those projects. The current study found out that Project Control mechanisms is very important as it moderates the relationship between combined rural electrification expansion strategies and implementation of energy access projects in underserved counties in Kenya as shown by the empirical study findings of the study.

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APPENDICES

Appendix I: Researcher Introductory Letter

Evans Kituzi Avedi
University of Nairobi
P.O. Box 30197, GPO
Nairobi
Department of Open and Distance Learning

Dear Respondent,

RE: REQUEST TO PARTICIPATE IN RESEARCH

I am Evans Kituzi Avedi, a PhD student in the Department of Open and Distance Learning at the University of Nairobi. In partial fulfillment of the requirements of the degree of Doctor of Philosophy in Project Planning and Management, I am conducting a research on *"Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects in Underserved Counties in Kenya,"*

I kindly request your input through filling this questionnaire. Please note that your honest responses will be strictly confidential and purely for academic purpose. Your acceptance to complete this questionnaire is greatly appreciated.
Thanking you in advance for your co-operation

Yours Faithfully,

Evans Kituzi Avedi
Reg No.: L83/51701/2017

Appendix II: Questionnaire for Residents

The aim of the study is to examine rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved counties in Kenya. Kindly tick the choice you deem most appropriate.

SECTION 1: BACKGROUND INFORMATION		
BG01	Questionnaire Serial Number	
BG02	Date	
BG03	Project Name	
BG04	County	
BG05	Indicate your First Name	
BG06	What is your age group? (circle the age group)	Under 30 years……..1 31 – 40 years……..……...2 41 – 50 years……...…..3 51 – 60 years……4 Over 60 years……....5
BG07	Indicate your Gender	Male……..1 Female……...2
BG08	What is your job/trade/profession?	
BG09	What is your job in this organization?	
BG10	What is the highest level of education you have attained?	Post-secondary Artisan Certificate……...…1 Diploma……2 Undergraduate…….....…...3 Masters…….....…4 PhD…….....5 Other (specify)…….....……6
BG11	For how long have you lived or worked in this area	Less than 1 year……1 1 – 5 years…….…….....2 6 – 10 years……3 11 – 15 years…….....4 16 – 20 years…….…….....5 Over 20 years…….……...6

SECTION 2: Implementation of Energy Access Projects

Implementation of energy access projects refers to the status of rural households supplied with electricity and being completed within time, cost and quality to the satisfaction of the consumers. The Government had intended to increase electrification connection to the majority of households in your area. Do you think this initiative was achieved? Kindly rate the statements by circling the appropriate scale of 1 – 5 among the following: Very Great Extent (5), Great Extent (4), Moderate Extent (3), Small Extent (2) and Very Small Extent (1)

	Statement	**5**	**4**	**3**	**2**	**1**
Number of Households, Schools and Commercial Centers Connections						
IP1	Funds allocated to energy access projects in my county is enough	5	4	3	2	1
IP2	My level of income allows me to get access to energy connectivity	5	4	3	2	1
Number of Projects Completed Within Budget						
IP3	Projects were completed within the set budget	5	4	3	2	1
IP4	The cost of the project matches the expected standards	5	4	3	2	1
Number of projects Completed Within Time						
IP5	Projects were implemented within the assigned time frame	5	4	3	2	1
IP6	Project delays were experienced during implementation	5	4	3	2	1
Frequency of Maintenance						
IP7	Residents were informed of warranty and maintenance schedule	5	4	3	2	1
IP8	It takes long for maintenance team to respond to a failure in electricity	5	4	3	2	1
Quality of Projects Completed						
IP9	I experienced less cases of quality of goods supplied for this project	5	4	3	2	1
IP10	The quality of implemented projects met the required standards	5	4	3	2	1

2a. State three key challenges you encountered during implementation of rural energy projects

1)

2)

3)

2b. What actions do you think can be undertaken to fasten rural electrification in your area

SECTION 3: Project Control Mechanisms

Project Control Mechanism in Project Management refers to the establishment of effective control mechanisms to ensure the project meets intended goals, while adhering to the laid down time and budget limits. The major elements of project controls include tracking time and cost, prioritization, handling contingencies that occur during project implementation, tracking key project milestones to ensure the project remains on track, and controlling and managing outside resources involved in the project.

The government's aim was to initiate control mechanisms to ensure this project is completed successfully within time, cost and quality. Do you think this initiative was achieved? Kindly rate the statements by circling the appropriate scale of 1 – 5 among the following: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2) and Strongly Disagree (1)

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Planning and Standardization of Project Control Mechanisms						
PC1	I was involved in initiating project control mechanisms during implementation of this project	5	4	3	2	1
PC2	Implementation of energy access depends entirely on proper planning	5	4	3	2	1
PC3	I am aware that standardization ensures many people in my county can afford energy access products	5	4	3	2	1
PC4	Am satisfied with the support given by the service providers in ensuring the project meets the required standards	5	4	3	2	1
Engineering Design						
PC5	I was trained how to install and operate the equipment implemented in the project	5	4	3	2	1
PC6	Due to properly designed works, repeat jobs have tremendously reduced	5	4	3	2	1
PC7	I was involved in determining the product that best suit people in my county	5	4	3	2	1

Operation and Maintenance						
PC8	Are you aware of operation and maintenance schedules available	5	4	3	2	1
PC9	In case of a problem, how fast is the service restored back	5	4	3	2	1
PC10	Am satisfied with the level of maintenance given to us	5	4	3	2	1

3a. State three key challenges you encountered during project control mechanisms

1)

2)

3)

3b. What suggestions can you propose in order to handle the challenges of planning and standardization, design and operation& maintenance

SECTION 4: Project Planning

The government's aim is to increase rural electrification expansion by coming up with strategies meant to ensure projects are well planned and coordinated. Do you think this was done? Kindly rate the statements by circling on the appropriate scale of 1 – 5 among the following; Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1)

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Policy Formulation						
PP1	I am aware of the government's initiative to bring electricity to my area	5	4	3	2	1
PP2	I am aware that energy access will improve the socioeconomic status of my county	5	4	3	2	1

PP3	I was offered clarification and support I required during energy access implementation in my county	5	4	3	2	1
PP4	I was briefed on the project prior to implementation	5	4	3	2	1
Building Capacity						
PP5	Staff used in energy access projects were regularly trained	5	4	3	2	1
PP6	Am aware of available facilities for training personnel in energy sector in my area	5	4	3	2	1
PP7	I was involved in initiating training needs for my area					
Integrating Energy Access with Development Programs						
PP8	I am aware of the other ministries that support energy access collaboration among development ministries in my county	5	4	3	2	1
PP9	There is no duplication of energy access projects in my area	5	4	3	2	1
PP10	I participated in meetings that determined energy access needs in my county					

4a. State three key challenges you encountered when enforcing project planning strategy

1)

2)

3)

4b. What suggestions can you propose to handle the challenges of enforcing project planning strategy

SECTION 5: Project Service Outsourcing

Project Service Outsourcing allows a company to execute entire projects using the resources of another firm. The project outsourcing approach allows companies the benefits of external expertise, cost management and risk mitigation so they can concentrate existing resources on their core operations.

The government's aim is to increase rural electrification expansion by coming up with strategies meant to ensure that more private sector players take part in implementation of energy access projects in your county. Do you think more private sector players came in to support this government's initiative?

This section contains statements on Project service outsourcing. Kindly rate the statements by circling on the appropriate scale of 1 – 5 among the following; Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1)						
	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Scope of Project Activities						
PS1	I support the initiative of project service outsourcing in ensuring that more remote areas in my county are covered	5	4	3	2	1
PS2	Electricity connectivity has increased due to outsourcing to private sector	5	4	3	2	1
PS3	I am aware of capability of outsourced firms in my county	5	4	3	2	1
Technology Customization and Innovation						
PS4	Up to date was used in the energy access project	5	4	3	2	1
PS5	The needed technology was readily available	5	4	3	2	1
PS6	I understand that technology offered addressed the needs of my county	5	4	3	2	1
Development of Business Models						
PS7	Affordable models are available	5	4	3	2	1
PS8	There are more products in the market because of outsourcing	5	4	3	2	1
PS9	Product are serving us longer and very user friendly	5	4	3	2	1
PS10	I Participated in deciding the type of model used in my county	5	4	3	2	1

5a. State three key challenges you encountered when enforcing project service outsourcing strategy

1)

2)

3)

5b. What suggestions can you propose to handle the challenges of enforcing project service outsourcing strategy

SECTION 6: Project Fund Mobilization

The government's aim is to increase rural electrification expansion by coming up with strategies meant to ensure that more investors take part in financing energy access projects. Do you think more investors came in to support this government's initiative? This section contains statements on Project fund mobilization strategy. Kindly rate the statements by circling on the appropriate scale of 1 – 5 among the following; Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1)

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	Attracting Private Investments					
PFM1	I am aware of private funding companies operating in the energy access projects in my area	5	4	3	2	1
PFM2	Am aware of the challenges in securing funding in the energy sector in my area	5	4	3	2	1
PFM3	Investment in the energy sector has significantly increased in my area	5	4	3	2	1
PFM4	I support the role played by project funding institutions in my county	5	4	3	2	1
	Leverage Funding					
PFM5	Enough funding was available at all times during project implementation	5	4	3	2	1
PFM6	Disbursement of funds was done on schedule	5	4	3	2	1
PFM7	Due to partnership with funding institutions, connectivity has increased	5	4	3	2	1
	Attract Impact Investors					
PFM8	I am aware of the role played by Government and other funding institutions in increasing investors in the energy sector in my county	5	4	3	2	1
PFM9	Am aware of the role of impact investors in my county	5	4	3	2	1

PFM10	Creating a conducive environment increased investment in the energy projects in my area	5	4	3	2	1

6a. State three key challenges you encountered when enforcing project fund mobilization strategy

1)

2)

3)

6b. What suggestions can you propose to handle the challenges of enforcing project fund mobilization strategy

SECTION 7: Project Company

The government's aim is to increase rural electrification expansion by coming up with strategies meant to ensure that more energy access projects are executed in a more professional manner. Do you think projects were executed faster and in an accountable way? This section contains statements on Project company strategy. Kindly rate the statements by circling on the appropriate scale of 1 – 5 among the following; Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly Disagree (1)

	Statement	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
	Single Point of responsibility					
IC1	Poor workmanship is evidenced by lack of qualified contractors	5	4	3	2	1
IC2	I am aware of the role of contractors in increasing speed of execution of the projects in my area	5	4	3	2	1
IC3	I support the use of contractors in the implementation of projects in my county	5	4	3	2	1
	Contract Price					
IC4	I did not experience projects disruption because of cost overruns	5	4	3	2	1
IC5	Involving engineering, procurement and contracting firms in execution phase of this project ensured projects are completed in time	5	4	3	2	1
IC6	Am aware of the implications of the project company delaying the project in my county	5	4	3	2	1

IC7	Am aware of the timelines set for completion of energy access projects in my county	5	4	3	2	1
	Service Level Agreements/warranty					
IC8	Products for this project are provided with warranty	5	4	3	2	1
IC9	In case of a faulty product do you know where to take the product for warranty claim	5	4	3	2	1
IC10	Am satisfied with the level of service offered by the project company in my county	5	4	3	2	1

7a. State three key challenges you encountered when enforcing project company strategy

1)

2)

3)

7b. What suggestions can you propose to handle the challenges of enforcing project company strategy

Appendix III: Interview Guide for Project Team Leaders and Site Agents

INTRODUCTION

This interview is designed to obtain information for academic purposes only. The accuracy of the responses you provide will be very important to the success of this research thesis. The findings of the study are hoped to make a significant contribution towards rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved counties in Kenya. The interview will take approximately 25 minutes. You are therefore requested to assist with the interview. Thank you

SECTION A: Demographic information

1. Gender: Male/Female
2. What is your professional qualification? Probe on year obtained
3. How long have you worked for your organization? (Probe on areas/departments worked)

SECTION B: Information on specific variables of study

4. Briefly describe the project planning strategy within your organisation? Probe on policy formulation, building capacity and integrating energy access with development programs
5. Briefly describe project service outsourcing strategy within your organization. Probe on scope of project activities, technology customization and innovation and development of business models
6. Briefly describe project fund mobilization strategy within your organisation. Probe on attracting private investments, leverage funding and impact investment
7. Briefly describe the project company strategy within your organization. Probe on single point of responsibility, contract price and service level agreement
8. How are project stakeholders involved in the project control mechanisms? Probe on planning and standardization, engineering design and operation and maintenance
9. Kindly explain the implementation of the rural energy projects in terms of rural energy access. Probe on number of connections on commercial centres, schools and households, projects completion within budget, time and quality
10. Is there any other comment that you would like to share with me?

Thank you

Appendix IV: Observation Guide

Preliminary activities: Choosing a site, gaining permission, scanning the site and familiarizing oneself with the setting

Name of Project:……..…….

Site Location:……...…….

Project Activity:…….…….

Trade of Persons involved:……

Date and Time Duration:……...

1. Observe and describe the project implementation progress on site
2. Observe and describe the workmanship of the executed projects
3. Observe the quality of products during implementation at the site
4. Interact and describe the satisfaction of the customers
5. Observe and document the gender ratio in the households
6. Any other observation?

THANK YOU FOR YOUR VALUED PARTICIPATION

Appendix V: List of Off -Grid Projects Implemented in Underserved Counties in Kenya

OFF GRID PROJECTS IN UNDERSERVED COUNTIES

NO.	COUNTY	CONSTITUENCY	TRADING CENTRE
1	GARISSA	IJARA	SANGAILU
2		DADAAB	LIBOI
3		LAGDERA	ELDERA
4		FAFI	GARSWEINO
5	MANDERA	BANISSA	KILIWEHIRI
6		MANDERA WEST	BURDURAS
7		MANDERA EAST	ARABIA
8		LAFEY	GARI
9		MANDERA SOUTH	SHIMBIR FATUMA
10		MANDERA NORTH	ASHABITO
11	MARSABIT	MOYALE	AMBALO
12		NORTH HORR	BALESA
13		LAISAMIS	ILLAUT
14	TURKANA	TURKANA CENTRAL	ELIYE (ILLE) SPRINGS
15		LOIMA	NAPELILIM
16		TURKANA NORTH	LOWARENG
17		TURKANA WEST	LETEA
18		TURKANA EAST	LOPEDURU
19		TURKANA SOUTH	KANGANGIPUR
20	WAJIR	TARBAJ	SARMAN
21		WAJIR EAST	RIBA
22		WAJIR NORTH	GURAR
23		ELDAS	BASIR
24		WAJIR WEST	HADADO
25		WAJIR SOUTH	SARIF BIYAMADHOW
27	Kilifi	KILIFI NORTH	KADAINA
28	KWALE	KWALE	WASINI/MKWIRO
29	TAITA TAVETA	TAITA TAVETA	RUKANGA
30	NAROK	NAROK NORTH	TALEK
31	NAROK	NAROK SOUTH	OLOOLAIMUTIAK
32	TANA RIVER	Galole	HOLA
33	SAMBURU	SAMBURU SOUTH	BARAGOI
34	TANA RIVER	Bura	CHARDENDE MARKET
35	ISIOLO	ISIOLO SOUTH	MERTI

Appendix VI: Reliability Statistics of all the Statements in the Questionnaire

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Funds allocated to energy access projects in my county is enough	403.0662	976.122	0.065	0.872
My level of income allows me to get access to energy connectivity	403.0331	972.079	0.125	0.872
Projects were completed within the set budget	402.8841	972.661	0.121	0.872
The cost of the project matches the expected standards	402.6358	974.631	0.107	0.872
Projects were implemented within the assigned time frame	402.4205	968.371	0.221	0.871
Project delays were experienced during implementation	402.3079	960.387	0.331	0.87
Have you been informed of warranty and maintenance schedule	402.0066	963.183	0.264	0.871
How long does it take for maintenance team to respond to a failure in electricity	402.3709	965.629	0.252	0.871
I experienced less cases of quality of goods supplied for this project	402.4901	974.264	0.094	0.872
The quality of implemented projects met the required standards	402.255	966.848	0.238	0.871
I was involved in initiating project control mechanisms during implementation of this project	402.2351	956.227	0.406	0.87
Do you think effective planning enhanced implementation of energy access projects in your area	401.851	957.695	0.399	0.87
I am aware that standardization ensures many people in my county can afford energy access projects	402.0232	956.986	0.433	0.87
Am satisfied with the support given by the service providers in ensuring the project meets the required standards	402.0464	956.689	0.439	0.869
I was trained how to install and operate the equipment implemented in the project	402.2086	956.332	0.426	0.869
All approved designs were to the required specification	402.2384	960.528	0.373	0.87
I was involved in determining the product that best suits people in my county	402.4007	958.115	0.4	0.87
Are you aware of operation and maintenance schedules available	402.0695	959.773	0.396	0.87
In case of a problem, how fast is the service restored back	402.5099	967.081	0.242	0.871
Am satisfied with the level of maintenance given to us	402.3477	959.902	0.356	0.87
I am aware of the Government's initiative to bring electricity to my area	401.6026	969.37	0.218	0.871
I am aware that energy access will improve the socio economic status of my county	401.4073	967.491	0.276	0.871

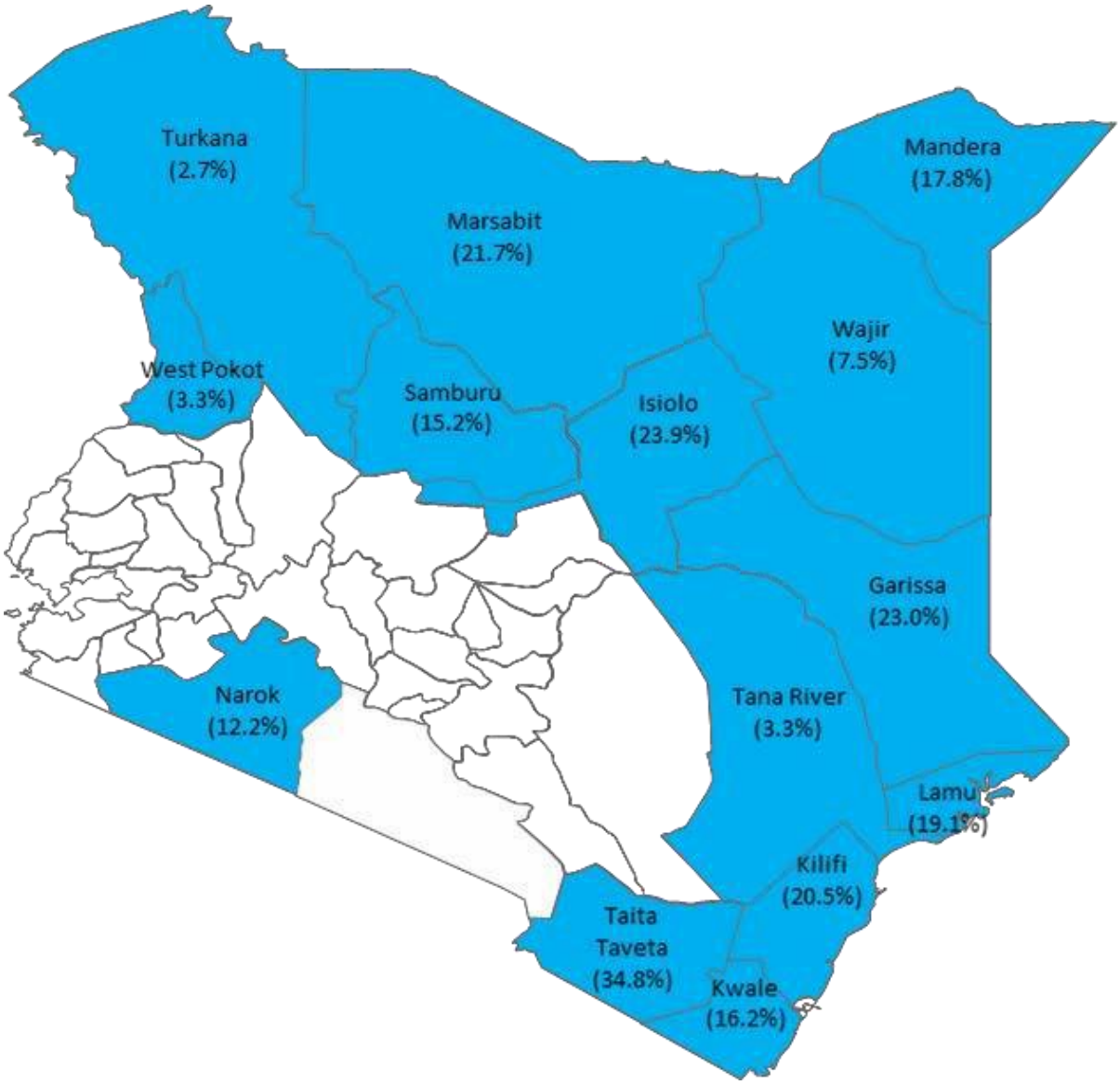
I was offered clarification and support I required during energy access implementation in my county	402.0497	966.4	0.274	0.871
I was briefed on the project prior to implementation	401.9834	960.236	0.357	0.87
Staff used in energy access projects were regularly trained	402.0397	962.709	0.386	0.87
Am aware of available facilities for training personnel in energy sector in my area	402.0199	959.169	0.426	0.87
I was involved in initiating training needs in my area	402.6126	959.441	0.4	0.87
I am aware of the other ministries that support energy access collaboration among development ministries in my county	401.9205	968.585	0.258	0.871
There is no duplication of energy access projects in my area	402.3046	967.428	0.261	0.871
I participated in meetings that determined energy access needs in my county	402.7947	972.35	0.145	0.872
I support the initiative of project service outsourcing in ensuring that more remote areas in my county are covered	401.2682	966.954	0.276	0.871
Do you think by outsourcing to private sector more people now have access to energy in your area	401.3642	961.9	0.356	0.87
I am aware of capability of outsourced firms in my county	401.6755	965.781	0.3	0.871
Up to date technology was used in the energy access project	402.1159	961.093	0.415	0.87
The needed technology was readily available	402.2649	965.278	0.327	0.871
I understand that technology offered addressed the needs of my county	401.9868	951.92	0.536	0.869
Do you think Governments outsourcing strategy brought in models that are affordable to people in your area	401.9768	964.614	0.326	0.871
There are more products in the market because of outsourcing	402.0397	964.297	0.325	0.87
Products are serving us longer and are user friendly	402.043	959.217	0.402	0.87
I participated in deciding the type of model used in my county	402.2285	965.22	0.285	0.871
I am aware of private funding companies operating in the energy access projects in my area	401.9801	963.222	0.336	0.87
Am aware of the challenges in securing funding in the energy sector in my area	401.4073	979.691	0.005	0.873
Do you think the Government has done enough to attract investments in the energy sector in your area	402.5795	973.135	0.127	0.872
I support the role played by project funding institutions in my county	401.7682	969.979	0.254	0.871
Enough funding was available at all times during project implementation	402.8411	974.965	0.129	0.872
Disbursement of funds was done on schedule	402.755	969.515	0.252	0.871

Do you think governments initiative to partner with funding institutions has made connectivity faster than before	401.8808	959.514	0.444	0.87
I am aware of the role played by the government and funding institutions in increasing energy investors in my county	402.0497	967.476	0.288	0.871
Am aware of the role of impact investors in my county	402.2947	953.81	0.459	0.869
Do you think if the government creates conducive environment more investors will invest in energy projects in your area	401.3344	964.589	0.287	0.871
Do you think contractors used in the energy access projects were highly qualified	401.4669	964.609	0.32	0.871
I am aware of the role of contractors in increasing speed of execution of projects in my area	401.4801	958.197	0.372	0.87
I support the use of contractors in the implementation of projects in my county	401.351	964.833	0.298	0.871
I did not experience projects disruption because of project cost overruns	402.7252	980.459	-0.01	0.873
Do you think involving engineering, procurement and contracting firms in execution phase of this project ensured projects completed as planned by the government	401.6589	965.01	0.272	0.871
Am aware of the implications of the project company delaying the project in my county	402.1788	973.064	0.136	0.872
Am aware of the timelines set for completion of energy access projects in my county	402.1258	966.257	0.26	0.871
Are you aware that all products for this project are provided with warranty	401.9801	962.531	0.358	0.87
In case of a faulty product do you know where to take the product for warranty claim	401.9007	960.887	0.342	0.87
Am satisfied with the level of service offered by the project company in my county	401.4106	966.469	0.245	0.871
Distribution of Respondents by Gender	404.0861	979.694	0.023	0.872
Distribution of Respondents by Age Bracket	402.5762	978.717	0.009	0.873
Distribution of Respondents by the Highest Level of Education	402.7848	980.043	-0.015	0.874
Distribution of Respondents by Period Lived or Worked in the Area	401.8907	976.403	0.025	0.874

Appendix VII: Sample Size Calculation for the Study

LOT	County	Households	Per grid	Mini grid	Target Population	Number of Respondents Sampled per Lot $n_h = (N_H/N) * n = (1380/5{,}604) * 373$
1	West Pokot	93,777				
	Turkana	123,191				
		216,968	230	6	1,380	92
2	Marsabit	56,941				
	Samburu	47,354				
	Isiolo	31,326				
		135,621	220	3	660	44
3	Mandera	125,497				
	Wajir	88,574				
		214,071	179	6	1,074	71
4	Garissa	98,590				
	Tana River	47,414				
	Lamu	22,184				
		168,188	220	4	880	59
5	Kilifi	199,764				
	Kwale	122,047				
		321,811	230	3	690	46
6	Taveta	71,090				
	Narok	169,220				
		240,310	230	4	920	61
	TOTAL			26	5,604	373

Appendix VIII: Rural Electrification of Target Counties in Kenya



Appendix IX: Overview of Underserved Counties in Kenya

	Underserved County	Surface area(km2)	Population	Population density (Pax/km2)	Access to energy rate (%)	
					2009	**2014**
1	Garissa	45,720	623,060	14	11.6	23
2	Isiolo	23,336	143,294	6	18.5	23.9
3	Kilifi	12,246	1,109,735	91	16.7	20.5
4	Kwale	8,270	649,931	79	10.6	16.2
5	Lamu	6,498	101,539	16	17	19.1
6	Mandera	25,797	1,025,756	40	2.5	17.8
7	Marsabit	66,923	291,166	4	7.5	21.7
8	Narok	17,921	850,920	47	5.9	12.2
9	Samburu	20,182	223,947	11	6.2	15.2
10	TaitaTaveta	17,084	284,657	17	15	32.8
11	TanaRiver	35,376	240,075	7	2.5	3.3
12	Turkana	71,598	855,399	12	2.4	2.7
13	Wajir	55,841	661,941	12	3.4	7.5
14	WestPokot	8,418	512,690	61	2.6	3.3
	Total&Ave	**417,210**	**7,574,110**	**18.2**	**8.7**	
	National	**581,296**	**38,610,097**	**66.4.**	**23**	**36**
	%ofNational	**72%**	**20 %**			

Source: Commission on Revenue Allocation, (2014)

Appendix X: Research Permit NACOSTI

THIS IS TO CERTIFY THAT:
MR. EVANS KITUZI AVEDI
of UNIVERSITY OF NAIROBI, 0-200
NAIROBI,has been permitted to conduct
research in *Garissa , Isiolo , Kilifi ,*
Kwale , Lamu , Mandera , Marsabit ,
Narok , Samburu , Taita-Taveta ,
Tanariver , Turkana , Wajir ,
Westpokot Counties

on the topic: *RURAL ELECTRIFICATION EXPANSION STRATEGIES, PROJECT CONTROL MECHANISMS AND IMPLEMENTATION OF ENERGY ACCESS PROJECTS IN UNDERSERVED COUNTIES IN KENYA*

for the period ending:
26th November,2019

.....
Applicant's
Signature

Permit No : NACOSTI/P/18/86460/26545
Date Of Issue : 28th November,2018
Fee Recieved :Ksh 2000

.....
Director General
National Commission for Science,
Technology & Innovation

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CONDITIONS

1. The License is valid for the proposed research, location and specified period.
2. The License and any rights thereunder are non-transferable.
3. The Licensee shall inform the County Governor before commencement of the research.
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
5. The License does not give authority to transfer research materials.
6. NACOSTI may monitor and evaluate the licensed research project.
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P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

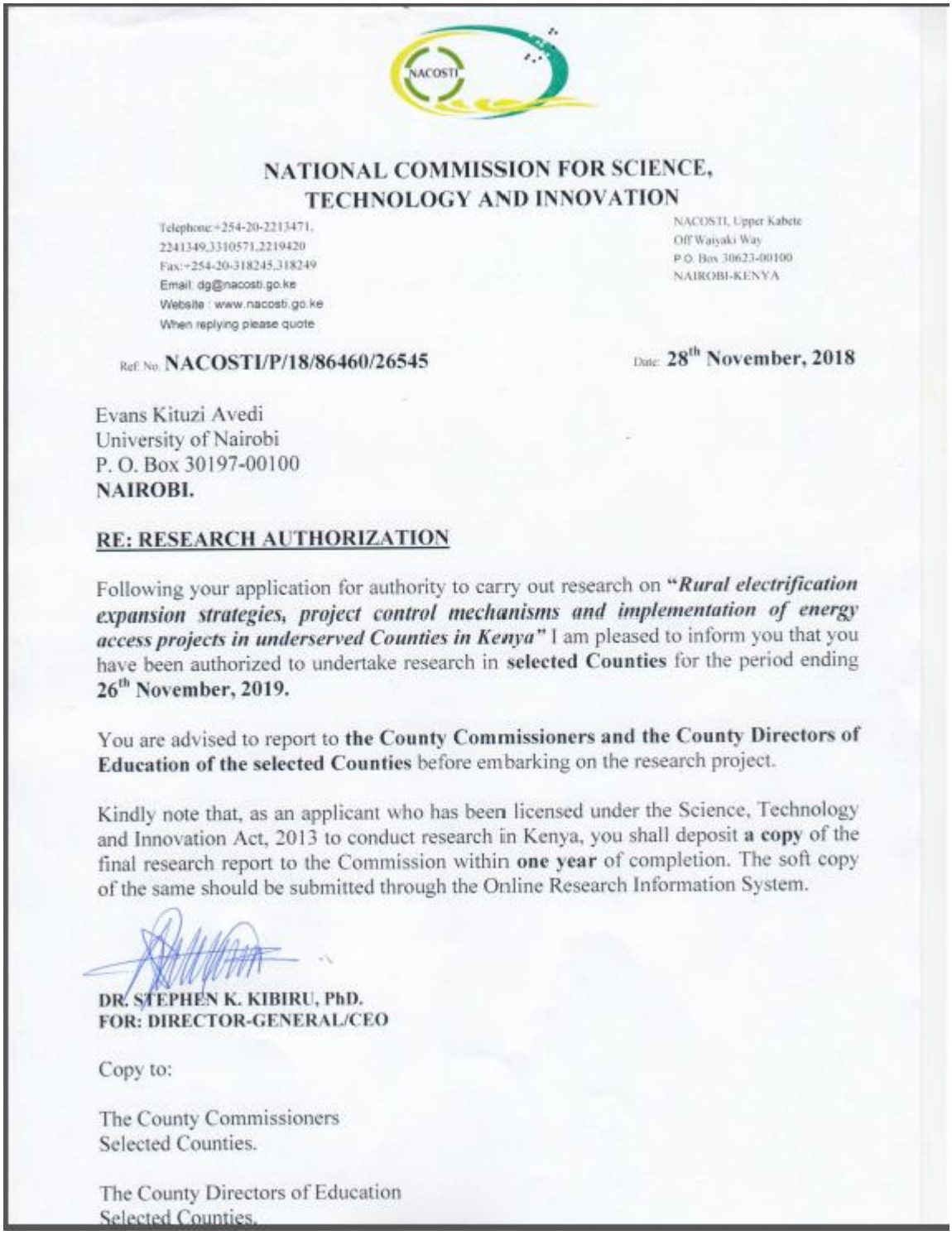
National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 22113

CONDITIONS: see back page

Appendix XI: Authorization Letter NACOSTI



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref No. **NACOSTI/P/18/86460/26545**

Date: **28th November, 2018**

Evans Kituzi Avedi
University of Nairobi
P. O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved Counties in Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **selected Counties** for the period ending **26th November, 2019.**

You are advised to report to **the County Commissioners and the County Directors of Education of the selected Counties** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioners
Selected Counties.

The County Directors of Education
Selected Counties.

Appendix XII: Authorization Letter (Council of Governors)

COUNCIL OF GOVERNORS

Westlands Delta House 2nd Floor, Waiyaki Way.
P.O. BOX 40401-00100,
Nairobi.

Tel : (020) 2403314, 2403313
+254 729 777 281
E-mail: info@cog.go.ke

Our Ref: COG/13/3 Vol.3 (53) 4th April 2019

Through: Excellency Governors

To: County Directors in Charge of Energy
(Garissa , Isiolo, Kilifi, Kwale, Lamu, Mandera, Marsabit, Narok, Samburu, Taita-Taveta County, Tana River, Turkana, Wajir and West Pokot Counties)

REQUEST TO SUPPORT PHD RESEARCH ON RURAL ELECTRIFICATION EXPANSION STRATEGIES IN YOUR COUNTIES

I refer to the attached letter dated 27th March 2019 from Evans Kituzi Avedi, regarding a request to undertake a PhD research on "Rural electrification strategies, project control mechanisms and implementation of energy access projects in underserved Counties in Kenya" between April 2019 and September 2019.

The purpose of this letter is to kindly request your support to enable Evans to undertake the research study jointly with the respective County Officers. As we expect a win-win undertaking, the researcher should at the end of the study, share a copy of preliminary findings, recommendations and advice with your respective Counties for consideration in the County implementation frameworks.

Jacqueline Mogeni, MBS
Chief Executive Officer

Copy: Evans Kituzi Avedi
PhD Student and applicant for the research
University of Nairobi

Encl. 1. Authorization Letter from University of Nairobi
2. Supporting authorizations (3 no) from National Commission for Science, Technology and Innovation (NACOSTI)

Appendix XIII: Authorization Letter (Rural Electrification Authority)

Rural Electrification Authority

Lighting up rural Kenya

Head Office
Kawi House - South C
Bellevue (Popo Rd), Red Cross Rd
Behind Boma Hotel.
P.O. Box 34585-00100, NAIROBI
Tel: +254 20 4953000 / 4953600
Email: info@rea.co.ke
Website: www.rea.co.ke

Ref: REA/HR/A/REC/122

15th March 2019

Evans Kituzi Avedi
P O Box 9520 – 00200
NAIROBI

Dear Evans,

RE: AUTHORIZATION TO CARRY OUT ACADEMIC RESEARCH

Your letter dated 4th March 2019 requesting for authorization to conduct academic research on households and commercial centers that have benefited from REA's off-grid and mini grid connectivity refers.

This is to inform you that the Authority has granted you permission to undertake your research in your selected underserved counties. Your contact person is Malik Issa; email- missa@rea.co.ke .

Further, you are also requested to share with us the findings of your research for purposes of our continued improvement in undertaking our mandate.

Lastly, we take this to wish you all the best in your research.

Yours Sincerely

Peter K. Mbugua
CHIEF EXECUTIVE OFFICER

Copy to: Manager, Planning, Monitoring & Evaluation
Principal Economist - Planning, Monitoring & Evaluation

Appendix XIV: Authorization Letter (County Government of Taita Taveta)

MINISTRY OF EDUCATION
State Department of Early Learning and Basic Education

Telephone: 0722160382
EDUCATION,
Email: cdetaitataveta@gmail.com
cdetaitataveta@yahoo.com

COUNTY DIRECTOR OF
TAITA TAVETA,
P.O BOX 130 - 80305,
MWATATE.

When replying please Quote:
Ref No. **TTC/EDU/R.2/VOL.1/129**

27th February, 2019

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – EVANS KITUZI AVEDI

Circular **Ref. No. NACOSTI/P/18/86460/26545** by National Commission for Science, Technology and Innovation dated 28th November, 2018 refers.

Authority has been granted to carry out a research on ***"Rural electrification expansion strategies, project control mechanisms and implementation of energy access projects in underserved Counties in Kenya"*** in Taita Taveta County for the period ending **26th November, 2019.**

On completion of the research, you are requested to submit a hard copy of the research report/thesis to our office.

COUNTY DIRECTOR OF EDUCATION
TAITA TAVETA
P. O. Box 130 - 80305,
MWATATE

SIMON M. WANJOHI
COUNTY DIRECTOR OF EDUCATION
TAITA TAVETA

C.c.
The County Commissioner,
TAITA TAVETA

Appendix XV: Authorization Letter (Institution)

UNIVERSITY OF NAIROBI
OPEN & DISTANCE e-LEARNING CAMPUS
SCHOOL OF OPEN AND DISTANCE LEARNING
DEPARTMENT OF OPEN LEARNING
NAIROBI LEARNING CENTRE

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

REF: UON/ODeL /SODL/NLC/403

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
N A I R O B I

25th October, 2018

TO WHOM IT MAY CONCERN

RE: AVEDI EVANS KITUZI -REG NO: L83/51701/2017

This is to confirm that the above named is a student at the University of Nairobi, Open Distance and e_Learning Campus, School of Open and Distance learning, Department of Open learning pursuing Doctor of Philosophy in Project Planning and Management.

He has done the course work and currently working on her research thesis entitled **"Rural Electrification Expansion Strategies, Project Control Mechanisms and Implementation of Energy Access Projects in Underserved Counties in Kenya."**

Any assistance accorded to him will be highly appreciated.

UNIVERSITY OF NAIROBI ODEL CAMPUS
P.O. Box 30197,
25 OCT 2018
NAIROBI
NAIROBI LEARNING CENTRE

DR. ANGELINE MULVA
COORDINATOR
NAIROBI REGION