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Electricity Access Project Services and Community Development in Rwanda; A Case of EPC Project in Burera District

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Abstract

The overall goal of this study was to investigate the relationship between electricity access project services and community development. The study's three main goals were to determine the impact of electricity connection services, the effect of electricity maintenance services, and the relationship between electricity vending services and community development in Rwanda using the example of the EPC project in Burera District. The research project is a significant to different stakeholders including public administration, management and business development partners, future academicians, lecturers, researcher himself and the community in general. For data collection via interview and questionnaire, the researcher employed a descriptive study design that combined qualitative and quantitative data. The total population was 4,291 and designed a sample size of 393 in which the researcher used census for all 24 staff and 4 stakeholders, and then simple random sampling of 365 respondents from 4,263 project beneficiaries. The researcher presented the data in tables and used descriptive and inferential statistical analysis with mean, standard deviation, and Chi-square to examine the findings. The researcher found that electricity access is one of the ways that facilitated community development in Rwanda and that there is good electricity connection services in Rwanda, mean 3.75; good electricity maintenance services in Rwanda, mean 3.55 and good electricity vending services in Rwanda, mean 3.45; statistically sign=0.000<0.05. The role of electricity access on community development include enabling income generation activities, enhancing improved health and education services. The effects of electricity maintenance services on community development include effects from power interruptions such as reduction of working duration, increasing cost of production, fall on quality

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of products and services, damage of appliances, and that unreliable power affect most health sector, followed by businesses and education services. Electricity vending services and community development in Rwanda are positively correlated in the way that it is easy to buy electricity through private telecommunication companies and banks; good tariff for residential households, industry and health facilities enables community development. On contrary, the researcher noticed a negative relationship in terms of encouraging small businesses and education facilities that have high electricity tariff, in turn play less contribution on community development in Rwanda. The researcher concluded that though electricity access is not the sole indicator, it has been one among the pillars that contributed on community development in Rwanda. The researcher argued that the country should continue the plan of electrification for all, enforcing mostly in those areas with big impact including industries, commercial centers, small enterprises, health and education facilities and other productive uses that contribute more to the living standards of the community, and commended quality of power supply and affordable electricity tariff to stimulate community development.

Keywords: Connection Services, *Maintenance Services, Vending Services, Burera District, Rwanda*

1.0 Introduction

Everywhere all over the world, electricity access go together with add-on and supporting activities and services contribute to better instructive achievement, more trade occasions, and complex income (Khandker *et al.,* 2013). It is almost impossible to ignore the role of electricity access on socio-development of any country and deficiency to reliable and affordable power reflects as a boundary on people's opportunities and affects businesses, residential and industrial beneficiaries (Schoeman & Saunders, 2018). The SDGs include connection to reliable and affordable, sustainable, and modern energy for all by 2030 as an unambiguous goal. Thus, access to electricity is considered to be a significant driver of sustained growth and is widely recognized by the international community. Electricity access is essential to the success of many of the other SDGs. Only connecting households to electricity is not sufficient to safeguard social economic development, it rather needs to be available reliable and affordable not only for families to get meaningful services but also for income making actions and community facilities (IEA, UNDP, & IRENA, 2018).

Since 2010, universal electrification moved from 83% to 89% of the world residents had access to electricity in 2017, with 840 million people of the global population with no electricity access and incresed from 39% in 2015 to 44% in 2017 in sub-sahara Africa with 573 million people without electricity access. Even if there has been faster progress of 1% for the years from 2015 to 2017, it has been a challenge to attain the annual average of 0.86% increase expected to reach common access by 2030. The twent with smallest electricty connected countries were dominated by sub-sahara Africa and were above 320 million people deficient to electricity in 2017 including Burundi, Malawi, Chad, and DRC at annual electrification rate of 1% from 2010. Rwanda and south sudan particularry stood out at the rate of 3% point annually (ESMAP, 2019). Rwanda in 2017 access rate was 34.1% and in 2018, electricity connection rate increased to 40.46% including 33.5% on grid connections and 6.96% through off-grid systems and later electricity access raised to 66.7% in September 2021 with a new country's electricity access target of 100% connection by

2024 (REG 2021). Since 2001, the country's economy has been rising progressively at averaged rate of 8% with more than US dollars 211 in 2001 to US dollars 718 GDP per capita in 2014.

Nutrition production yield increased to above twice that increase of population in the years from 2007 to 2014. From 2011 to 2014, doing businesses in Rwanda raised improved by 24.4% basically in rural villages and increased by 38.1% different from 7.3% in urban and again 34.5% new jobs were created among them 47.9% in rural area different from 22.1% in urban areas. Despite the commended effort of the government of Rwanda in increasing electricity access rate as a motorist for other development aspects, poverty was not alleviated and it is still affecting the community because poverty reduced only from 77% in 2011 to 55% in 2017 and later to 39% in 2020 (WB, 2017). Consequently, no existing empirical studies that proved the effects of electricity access services specifically electricity connection services, electricity maintenance services and electricity-vending services on community development of the country. For that reason, the researcher did a study to investigate the role and effect of electricity access project services on community development in Rwanda.

1.1 Problem of Statement

Despite the remarkable electricity access rate in Rwanda of 55.41% by end of June 2020 and 64.53% by end of June 2021 (REG, 2021), the role of electricity access on income generation, improved health services, educational services and community development is not yet attained. This is compared to the level of which electricity access has been expected to be essential necessity, catalyst for other development functions, and play huge part in everyday lives (Bahman, 2019). Electricity provision was one of the pillars to help Rwanda combat poverty addressing those issues hindering households income generation, rise in production and quality of goods and services, contribute to the country gross domestic product; quality of health services as well as improving education aspects some among determinants of well-being of the people. Rwanda still has very high power prices and interruption rates; in 2018, the SAIDI (System Average Interruption Duration Index) was 14.1 hours per year and the SAIFI (System Average Interruption Frequency Index) was at 91.7 times per year (Minenfra, 2018). Though 689 million of people are poor all over the world worth 9.2% of the world population and 42% in sub-Sahara Africa, live in extreme poverty (Word Bank, 2021). In Rwanda 56.9% people lived under poverty line and 37.9% under extreme poverty in 2018(NISR, 2018) while 40.46% people had access to electricity in 2018(MINALOC, 2017) and statistics per headcount show an increase of poverty by 5.1% in 2021(World Bank,2021). However, there are no researches conducted to investigate the effect of electricity access project services on community development. Some fewer studies conducted in this field including (Cyubahiro, 2013) and (Rutembesa, 2014) have put less attention on electricity access derivatives such as electricity connection services, maintenance service and vending Services on their effect on income generation, improved health services and better education in Rwanda. Thus, it is in this reason, the research seeks to conduct a study to investigate the effect of electricity access project services on community development in Rwanda with in a situation of EPC project in Burera Area.

1.2 Objectives of the Study

The general objective of this study was to examine the effect of electricity access project services on community development with a case of EPC Project in Burera District, Northern Province.

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2.0 Literature Review

Literature reviewed the available theoretical literature, which describes electricity access services, electricity connection services, electricity maintenance services, Electricity Vending Services and community development.

2.1 Electricity Connection Services

Electricity access also called as electrification or electrification rate denotes to the portion of the residents with access to electrical energy out of the total population in the stated period of time or terrestrial area. It is demarcated as the ability of the consumer to use electricity for preferred niceties (World Bank, 2020). Electricity access includes both the number of households that have on grid connections and households that have off-grid systems. The aim of electricity services is to deliver the importance of electricity to clienteles. Thus, electricity services are used to designate those importances (Mutale *et al.*,(2007). Electricity services for ménages refers to illumination, cooking, proper indoor temperature, cooling, telecommunication, schooling and transport (Bilgiç, 2017). Service requirements is also a wide word that involves a number of features of electricity services and service requirements triggers the investment and operative cost in electricity supply and are proactive planning and cost driver in during the provision of electricity access services (Mutale *et al.,* (2007). However, electricity access services are costly, yet essential resource for development. Thus, Deficiency of electricity access services causes social effects to the society in terms of lighting because people tend to use other means of energy which are dangerous to human being and cause environment pollution; affect cooling and heating but also information communication whereas ICT is important tool for poverty reduction (Bilgiç, 2017). Therefore, in this context electricity access services include connection services, maintenance services and development services.

2.2 Electricity Maintenance Services

Electricity maintenance services refer to the services of testing checking, fixing, repairing and replacing faulty tools in electrical systems for interrupted electricity. Electrical lines maintenance is important to ensure power reliability and stability. It involves line checks, ground pruning, correction of faulty tools like insulators, re-stringing of network, change of faulty jumpers, broken conductors, poles and other defected electrical tools. Carrying out maintenance in electrical distribution equipment provides five important benefits including safety and equipment protection, service permanence, energy-efficient equipment, efficient spare parts organization, improved total cost of ownership (Morte, 2015).

Rwanda regulations stipulates two types of electrical power interruptions including planned outages for preventive maintenance and unplanned power interruptions for reactive maintenance and states that in case of planned interruption should be early noticed customers within ten (10) days before interruption and to minimize power interruption, regulatory authority use indices like SAIDI & SAIFI for monitoring interruptions (RURA, 2016).

The term maintenance is a function devoted to keeping the system running as well as possible to make it reliable, productive and safe at optimal cost. Thus, electrical maintenance services ensures people safety and equipment protection, continuity of the service delivery, service efficiency as well as optimization of costs (Schneider Electric, 2015).

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2.3 Electricity Vending services

Electricity vending services in this study refers to the regulations and actions regarding production, transmission, distribution and the sale of electricity among the power producers, vendors and end-users of electricity connected to both prepayment or post-payment meters, and tariffs which is the price at which electrical energy is supplied to various types of electricity consumers (RURA, 2020).

A clear energy strategy, system planning and power sector governance system guides Rwanda electricity distribution market and regulatory and policy measures helps to address challenges that would constitute positive steps towards further strengthening the energy sector to support the ambition of Rwanda of economic transformation through private sector investment participation in energy infrastructure development (United Nations, 2021).

The Ministry of infrastructure (MININFRA) has the principal obligation to set the plan and strategy of the energy sector and ensure coordination in terms of the energy sub-sector growth. The national utility, a business that is wholly controlled by the government and a few independent power producers (IPPs) operate Rwanda's energy market. Rwanda Energy Group (REG) implements the administrative roles of the nationwide utility through its two affiliates, Energy Utility Corporation Limited (EUCL), which is responsible for producing and distributing electricity nationwide and overseeing grid operations, and Energy Development Corporation Limited (EDCL), which is in charge of planning and developing energy facilities.

IPPs sell their generated electricity to EUCL, a monopoly firm that handles electricity transmission, distribution, and vending to users connected to the grid on a national and international scale. The Energy Sector Strategic Plan of 2018/19 to 2023/24 set goals to attain 100% electricity for all citizens by 2024 made of 52% to be connected by means of the grid and the remaining 48% to be serviced by off-grid solutions (MINENFRA, 2018).

To diminish the charge of electricity connection, National Electrification Plan was elaborated detailing zones to be electrified with off-grid facilities and those with grid network extension. The grid electricity is produced from diverse renewable and non-renewable resources specifically Hydro, Methane gas take out from Kivu Lake, fossil fuel, Peat and Solar and fossil petroleum. Some part of electricity is produced countywide-shared hydroelectric power projects like Rusizi I and Rusizi II and a minor portion of electricity is sourced from Uganda and vice versa. Off-grid electricity made from solar photovoltaic systems and mini- hydropower systems.

The law governing electricity in Rwanda gives license to Rwanda Utility Regulatory Agency (RURA) to regulate activities of generation, transmission, delivery and vending of electricity nationally and exterior the country. Rwanda energy policy has main purpose for electricity sub-sector is to provide enough, reliable, sustainable and more affordable power delivery.

The policy aims to attain a sustainable transition to a cost-reflective, affordable electricity tariffs through pronged methods. The first method involves disaggregating tariffs by consumers to ensure that they properly replicate the virtual influences to the price base and the second approach refers to increasing operational efficiencies and savings on the required revenues of the utility. The third approach aims at diminishing the marginal cost of power production via the raise of imports and utilization of alternative technologies and the fourth approach refers to applying loss minimization

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and demand management plans to cut peak demand load and grid reserve margin requirements (MINENFRA, 2015).

Thus, there is a clear economic regulation for networks under defined tariff methodology structure, which is regulation cost-based, and periodically develop revised tariff as such network economic regulation in Rwanda to incentivize efficiency. RURA legalize a demand charge tariff section along with time of use based system and REG establish a dedicated demand side management (MINENFRA, 2015).

2.4 Community Development

Community development gives individuals and social groups the tools they need to improve their lives. The goal of community development is to overcome inequalities in welfare and power based on inclusion, human rights, social justice, equity, and equality. It is an optimistic variety and value-based approach (Buye, 2021). The main concern of community development approach is on establishing those collaborative processes that help community to make autonomous decisions on their wants and the problems that affect their existence including poverty and other related poor living conditions and community development has the potential to bring change in its status. Thus, lack of electricity leads people to continue relying on traditional fuels like biomass in form of firewood, charcoal agriculture and industrial waste (Stephen, Kusum, & Suani, 2004) .

Access to electricity has been acknowledged as being essential to supporting the social and economic development of rural communities and reducing poverty. It is a fundamental component of community economic and social development. Lack of consistent access to power places a limit on people's chances and quality of life (Riva *et al.*, 2018).

3.0 Methodology

The study utilized a quantitative design. The use of quantitative methods was considered advantageous as it allowed for statistical analysis of the data. The study's target population consisted of 4,291 connected project beneficiaries in Burera District, distributed among the district's 17 sectors. The sample size for the study was 393 respondents, calculated using Yamane’s formula and census method. The number of respondents from each sector was obtained using stratified sampling techniques. A questionnaire containing close-ended questions was administered to the respondents through personal interviews at their premises, collecting primary information from electricity connected households owners. The collected data were analyzed using quantitative data analysis approaches, generating descriptive statistics outputs using Stata version 17 and SPSS version 24 tools. Pearson Chi-square tests were used to test the effect of electricity services on Community Development. The means and standard deviations of the respondent scores were computed for the Likert statements to assess the key effects of electricity connection, maintenance and vending services on community development. These scores were analyzed by comparing the mean scores and deviations among the respondents.

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4.0 Key Findings and Discussion

4.1 Demographic Characteristics of Respondents

Before proceeding to present and discuss the findings, it is important to indicate the socio-demographic information of 393 asked respondents in Burera District. About 59.3% of the total respondents were males while the share of females was 40.7%. Referring to their marital status, about 86.7% of male respondents were married while female respondents were 86.9%. 13.5% of respondents have a university level, 19.8% have a secondary level, and 66.7% of all respondents have a primary level. Among male respondents who have a higher share, have a primary level (68.7%), while female respondents, have also primary level (63.7%). Also, male respondents who have a university level were 14.2%, while female respondents who have a secondary level were 23.8%. This ensured a good sample population who was educated and therefore, was in a better position to answer questions on the topic of the study. The majority of the respondents were within the age group from 31-40 years (70.7%) followed by age group of 41-50 years (12.5%), group above 50 was 9.2%, and the group from 18-30 years was 7.6%. This age group distribution was good, because the study was able to collect data from specifically old respondents who provided good information on effect of electricity services on community development in Rwanda.

4.2 Descriptive Statistics of Findings

In this section, the researcher discusses the study's findings in regard to its objectives. The researcher presented findings on the role of electricity connection services on community development, the effects of electricity maintenance services on community development and relationship between electricity vending services and community development. Findings on assessment of community development in Rwanda and respondent's views form interview were presented in this section.

4.2.1. The role of Electricity Connection Services on Community development

For this objective, the researcher concentrated on presenting, analyzing and interpreting the view of respondents in relation with electricity connection services and community development.

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Table 1: Assessment of electricity connection services and community development

No	Items	Mean	Standard deviation
1	**Electricity connection services and community development**		
1.1	Grid connection enables income generation	4.34	0.765
1.2	Off-grid connection enables income generation	2.79	1.104
1.3	Three phase connection enables income generation	4.32	0.723
1.4	Single phase connection enables income generation	3.67	1.055
1.5	Grid connection facilitates education services	4.3	0.794
1.6	Off-grid connection facilitates education services	2.62	1.107
1.7	Three phase connection facilitates education services	4.21	0.926
1.8	Single phase connection facilitates education services	3.65	1.054
1.9	Grid connection enhances quality health services	4.33	0.776
1.10	Off-grid connection enhances quality health services	2.72	1.143
1.11	Three phase connection enhances quality health services	4.12	0.879
1.12	Single phase connection enhances quality health services	3.64	1.058
1.13	There are good electricity connection services in Rwanda	3.75	1.061

Source: Primary data, 2022

In Table 1, respondents revealed the benefits of electricity connection services on community development as follows:

For the indicator that grid electricity connection enables income generation, the mean scores 4.34 with standard deviation of 0.765. Thus, the average satisfactory of respondents to the role of grid electricity connection on income generation is strongly agree, very high level of satisfaction and the mean score of 2.79 with standard deviation of 1.104 indicates that satisfaction of the respondents for the role of off grid electricity connections to facilitate income generation is undecided, a moderate level of satisfaction. The indicator that three-phase connection enables income generation, the mean is 4.32 and standard deviation is 0.723, so then the average satisfactory of the respondents is strongly agree, very high level and a mean of 3.67 with standard deviation of 1.055 indicates that the average satisfaction of the respondents that single-phase connection enables income generation is agree or high level.

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The indicator that grid electricity connection facilitates education services shows the mean score of 4.30 with standard deviation of 0.794. The average satisfactory of respondents to the role of grid electricity connection on education services is strongly agree, High level and the mean score of 2.62 with standard deviation 1.107 indicates that respondents neither agreed nor disagreed for the role of off grid electricity connections to facilitate education services. For indicator that three-phase connection facilitates education services, the mean is 4.21 with standard deviation is 0.926, so then the average satisfactory of the respondents is strongly agree, high level and a mean of 3.65 with standard deviation of 1.054 indicates that the average satisfaction of the respondents that single-phase connection facilitates education services is agree, high level.

For the indicator that grid electricity connection enhances quality health services, the mean score 4.33 with standard deviation of 0.776, strongly agree or very high level of satisfaction and the mean score of 2.72 with standard deviation of 1.143 shows that did not decide on the role of off grid electricity connections to enhance quality health services. The indicator that three-phase connection enhances quality health services, the mean is 4.12 and standard deviation is 0.879, so then the average satisfactory of the respondents is agree, high level and a mean of 3.64 with standard deviation of 1.058 indicates that the average satisfaction of the respondents that single-phase connection enables health services is agree or high level. The mean of 3.75 with standard deviation of 1.061 displays agree or high level of satisfaction of respondents that there are good electricity connection services in Rwanda.

This led the researcher to the understanding of a positive relationship of grid, three phase and single phase electricity connection on community development in Rwanda, hence the preference of grid electricity connection than off-grid connection, three-phase electricity connection than single-phase connection. Respondents pointed the problem of off-grid systems failure specifically in wet season and the weakness to run big appliances. Respondents highlighted the problem of late service delivery in terms of electricity connection services yet beneficiaries fulfilled the requirements.

For 81 interviewed respondents on the question of how electricity access services supported community development in Burera, 42(51.8%) responded the use of electricity only for righting, 22(27.2%) job creation, 9(11.1%) for improving health and hygiene, 7(8.6%) security purpose and 1(1.2%) for cooking. Thus, electricity access is one determinants of community development.

4.2.2. Effects of Electricity maintenance services on Community Development

In this objective, the researcher concentrated on presenting, analyzing, interpreting and discuss results from the view of respondents in evaluation of effects of electricity maintenance services on community development.

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Table 2: Assessment of electricity maintenance services and community development

Items	Mean	Standard deviation
Effects of electricity maintenance services and community development		
There is a stable power supply in Rwanda	3.38	1.208
Power cuts reduce working duration in Rwanda	3.59	1.039
Power cuts increase cost of production and services in Rwanda	3.63	1.025
Power cuts affect the quality of products and services in Rwanda	3.41	1.173
Power cuts affect Health services in Rwanda	3.44	1.13
Power cuts affect Business growth in Rwanda	3.36	1.119
Power cuts affect Education services in Rwanda	3.34	1.076
Power cuts damage appliances	3.57	1.013
There are generally good electricity maintenance services in Rwanda	3.55	1.108

The mean scores (3.38) with standard deviation (1.208) of the respondents in the table 2 shows that power is not stable or not reliable in Rwanda. The satisfaction level of the respondents was undecided or moderate level and have not been satisfied with many power cuts and interruptions. The mean scores (3.59) with standard deviation (1.039) shows agreement (high level) of respondents that power interruptions reduce working duration in Rwanda, similarly with the mean scores (3.63) with standard deviation (1.025) of the respondents agreed that power interruptions increase cost of products and services in Rwanda. Respondents agreed on the indicator that power interruptions damage appliances where by the mean scores (3.57) with standard deviation (1.013), similarly agreed on the indicator that there are generally good electricity maintenance services in Rwanda. The mean scores (3.41) with standard deviation (1.173) of the respondents agreed that Power cuts affect the quality of products and services in Rwanda.

This led the researcher to the understanding the problem of power interruptions in Rwanda in terms of both frequency and duration that in turn affect community development in Rwanda. Health services is the most affected with the mean scores (3.44) and standard deviation (1.13) of the respondents agreed, but respondents did not decide on power effects on business growth with the mean scores (3.36) with standard deviation (1.119) and effects on education services with the mean scores (3.34) and standard deviation (1.076).

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For 81 questioned respondents on the quality of electricity maintenance services in Rwanda, 21(25.9%) responded very good, 45(55.6%) good, 12(14.8%) poor and 3(3.7%) very poor, but did not accept (undecided) that there is reliable/stable power supply in Rwanda with a moderate mean 3.38 and standard deviation 1.208. Power interruptions affect quality of products and services 25(30.9%), burnt of equipment 23(28.4%), damage of perishable products 17(21.0%), increase in cost of production and services 16(19.8%). Therefore, reliable electricity supply should be a concern to put into consideration to ensure community development in Rwanda.

Table 3: Effects of electricity maintenance services on community development

	There is a stable power supply in Rwanda	Power cuts reduce working duration in Rwanda	Power cuts affect Business growth in Rwanda	Power cuts increase cost of production and services in Rwanda	Power cuts affect the quality of products and services in Rwanda	Power cuts affect Health services in Rwanda	Power cuts affect Education services in Rwanda	Power cuts damage applianc es	There are generally good electricity maintenance services in Rwanda
Chi-S	268.616a	135.181a	294.137a	147.954a	259.252a	256.198a	220.066a	257.929a	288.921a
Df	4	4	4	4	4	4	4	4	4
A.Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Primary data, 2022

The findings from Table 3 of the status of whether there is a stable power supply in Rwanda, show statistically significant with (χ^2 (2) = 268.616, sign=0.000<0.05), Power cuts reduce working duration in Rwanda, has statistically significant with (χ^2 (2) = 135.181a, sign=0.000<0.05). Power cuts affect Business growth in Rwanda, has statistically significant with (χ^2(2) = 294.137, sign=0.000<0.05). Power cuts increase cost of production and services in Rwanda, has statistically significant with (χ^2(2) = 147.954, sign=0.000<0.05). Power cuts affect the quality of products and services in Rwanda, this has statistically significant with (χ^2 (2) = 259.252, sign=0.000<0.05). Power cuts affect health services in Rwanda, this has statistically significant with (χ^2(2) = 256.198, sign=0.000<0.05). Power cuts affect education services in Rwanda, this has statistically significant with (χ^2(2) = 220.066, sign=0.000<0.05). Power cuts damage appliances, this has statistically significant with (χ^2(2) = 257.929, sign=0.000<0.05) , and the status of whether there are generally a good electricity maintenance services in Rwanda, this has statistically significant with (χ^2(2) = 288.921, sign=0.000<0.05). In all these tests of significance just generated, p-value (asymptotic Significance) is less than 0.05, the p-value in our chi-square results is p = 0.000, we can confirm that The two variables have a statistically significant correlation. Therefore, the statistics test has provided enough evidence that the effect between electricity maintenance services and community Development is statistically significant.

4.2.3. Relationship between Electricity Vending Services and Community Development

In this objective, the researcher concentrated on presenting, analyzing and interpreting the view of respondents on the relation of electricity vending services with community development.

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Table 4: Assessment of electricity vending services and community development

Items	Mean	Standard deviation
Electricity vending services and community development		
Electricity tariff encourages investment in Rwanda	3.35	1.203
There is good electricity tariffs for residential houses in Rwanda	3.47	1.116
There is good electricity tariff for small businesses in Rwanda	2.75	1.17
There is good electricity tariff for industries in Rwanda	3.47	1.102
There is good electricity tariff for health services in Rwanda	3.53	1.132
There is good electricity tariff for education services in Rwanda	2.74	1.16
There are generally good electricity vending services in Rwanda	3.45	1.164

The mean scores (3.35) with standard deviation (1.03) of respondents in the table 4 shows that respondents neither agreed nor disagreed on the indicator that electricity tariff encourages investment in Rwanda but agreed a good electricity tariff for residential houses in Rwanda with the mean scores (3.47), standard deviation (1.116) of the respondents. The mean scores (3.47) with standard deviation (1.102) of respondents shows that respondents agreed that there is good electricity tariff for industries in Rwanda and that there is generally good electricity vending services in Rwanda with the mean scores (3.45) and standard deviation (1.164).

This led the researcher understanding the positive relation between electricity vending services and community development in Rwanda in regards to the electricity tariff for health facilities, the men scores (3.53) with standard deviation (1.132) of the respondents. Respondents neither agreed nor disagreed on good electricity tariff on small businesses, the mean scores (2.75) with standard deviation (1.17) of the respondents and electricity tariff on education facilities, the mean scores (2.74) with standard deviation (1.16) of the respondents.

For 81 questioned respondents on the indicator of electricity tariffs and community development, 16.0% responded very expensive, 44.4% expensive and only 39.5% responded that there is affordable tariff in Rwanda and highlighted that small businesses, schools face much effect from electricity tariff. Thus, revision of electricity tariff regulation would support community development in Rwanda.

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Table 5: Relationship of electricity vending services and community development

	Electricity tariff encourages investment in Rwanda	There is good electricity tariffs for residential houses in Rwanda	There is good electricity tariff for small businesses in Rwanda	There is good electricity tariff for industries in Rwanda	There is good electricity tariff for health services in Rwanda	There is good electricity tariff for education services in Rwanda	There are generally good electricity vending services in Rwanda
Chi-Sq	209.837[a]	280.677[a]	362.814[a]	253.807[a]	208.794[a]	337.980[a]	158.743[a]
Df	4	4	4	4	4	4	4
As. Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Primary data, 2022

The findings from Table 5 show that electricity tariff encourages investment in Rwanda, has statistically significant with (χ^2 (2) = 209.837, sign=0.000<0.05), there is good electricity tariffs for residential houses in Rwanda, has statistically significant with (χ^2(2) = 280.677, sign=0.000<0.05). The status of whether there is a good electricity tariff for small businesses in Rwanda, this has statistically significant with (χ^2 (2) = 362.814, sign=0.000<0.05). The status of whether there is a good electricity tariff for industries in Rwanda, has statistically significant with (χ^2 (2) = 253.807, sign=0.000<0.05). The status of whether there is a good electricity tariff for health services in Rwanda, this has statistically significant with (χ^2 (2) = 208.794, sign=0.000<0.05). The status of whether there is a good electricity tariff for education services in Rwanda, this has statistically significant with (χ^2 (2) = 337.980, sign=0.000<0.05), and the status of whether there are generally a good electricity vending services in Rwanda, this has statistically significant with (χ^2 (2) = 158.743, sign=0.000<0.05). In all these tests of significance just generated, p-value (asymptotic Significance) is less than 0.05, the p-value in our chi-square results is p = 0.000, we validate that the two variables have a statistically significant association. Therefore, the statistics test has provided enough evidence that the relationship between electricity vending services and community development is statistically significant.

5.0 Conclusion

The researcher concluded that even though electricity access is not the sole indicator for the development of the country; the role of electricity connection services is found in different sectors. Electricity access facilitates income generation, growth of the business, raising citizen's livelihood, and improving provision of health and education services. Electricity access plays and have impacts in strengthening security especially in public areas. The researcher commended more benefits of grid electricity services versus off-grid electricity services and more benefits of three-phase electricity connection versus single-phase electricity connection services.

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The research concluded that effects of electricity maintenance services on community development include mainly those from power interruptions including reduction of working duration, increasing cost of production, compromising quality of products and services and damage of appliances. The research concluded that unreliable power touches most health sector, followed by businesses and later education services.

The research concluded a positive relationship between electricity vending services and community development in Rwanda in the way that it is easy to buy electricity through private telecommunication companies and banks. Good tariff for residential households, industry and health facilities enables community development in Rwanda but a negative relationship occurs for encouraging small businesses and education facilities that have high electricity tariffs.

6.0 Recommendations

Based on the study results, the researcher has given the following recommendations to the government, private sector and investors, development partners and the community in general.

The researcher recommended that the country should continue the plan of electrification for all enforcing mostly in those areas with big impact including commercial centers, health facilities, education facilities and other productive uses that contribute more to the living standards of the community. Enforcement and extension of grid three-phase power infrastructures is recommended and off-grid for households in remote areas,

The government should put in place mechanisms of good and affordable settlement to facilitate provision and connection of all households to the grid electricity, and improve quality of off-grid systems. Power stability is also a concern that need more efforts, rehabilitation of old and undersized lines, live maintenance to ensure reliable supply,

The government should reset tariff that facilitate SMEs, encourage investment and doing business that play a great role in job creation and changing livelihood of the community.

Public private partnership is commended in energy sector in Rwanda to maintain sufficient generation, transmission and distribution infrastructures and provision of electricity for all.

Electricity access is an important factor for the development, Planned and implementation of socio and economic activities should consider electricity access infrastructures.

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