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Adu-Gyamfi Samuel

Kwame Nkrumah University of Science and Technology, Ghana
Private Mail Bag, University Post Office, KNUST – Kumasi, Ashanti, Ghana
mcgyamfi@yahoo.com
<https://orcid.org/0000-0002-0193-867X>

Amakye-Boateng Kwasi

Kwame Nkrumah University of Science and Technology, Ghana
Private Mail Bag, University Post Office, KNUST – Kumasi, Ashanti, Ghana
kwasiamaboat@yahoo.com
<https://orcid.org/0000-0003-3467-1315>

Awuah Dennis

Illinois State University, USA
Campus Box 4000, Normal, IL 61790-4000, USA
awuahdennis53@yahoo.com
<https://orcid.org/0000-0002-0203-0081>

Oware Richard

University of Saskatchewan, Canada
9, Campus Drive, Saskatoon, SK S7N 5A5, Canada
richardoware18@gmail.com
<https://orcid.org/0000-0002-3379-7664>

Quansah Stephen

Kwame Nkrumah University of Science and Technology, Ghana
Private Mail Bag, University Post Office, KNUST – Kumasi, Ashanti, Ghana
cafuiquansah@gmail.com
<https://orcid.org/0000-0003-0390-7911>

An evolutionary study of production of electricity in Ghana (1900 – 1960)

***Abstract.** The literature on the history of electricity production have studied the evolution of electricity in both developed and developing countries and its impact on their economies. Some have laid foundations upon which other works are carried out.*



A close examination of historiography and multidisciplinary research on electricity production in Ghana shows that more efforts are required to improve the electric power landscape in Ghana. From the colonial era, the increasing demand for electricity has been the biggest challenge plaguing the energy sector. Respective governments have made significant strides in ensuring reliable and universal access to electricity throughout Ghana, yet such efforts have been accompanied by different levels of challenges. The study uses a qualitative and exploratory research approach to trace the activities that helped, in many other ways to the creation of a sustainable electric power provision to household and industry in Ghana, particularly in two of Ghana's cities; Accra and Kumasi, within the period 1900 to the 1960s. The work focused mainly on archival sources in its quest to arrive at how indigenous Ghanaians provided power for industrial activities and for household purposes. Results from the study show that local and cottage industries relied predominantly on wood, fuel, and biomass for their operations even before the introduction of the more sophisticated means of power generation. Also, the study revealed that in finding solutions to the challenges of electricity production, policymakers have focused more on current issues with little or no effort to trace the historical foundation of electricity production. This notwithstanding, the little efforts that have been made examined the history of energy production, with a limited focus on the immediate post-independence era.

Keywords: *electric power; economic impact; social impact; Ghana; Kumasi; Accra*

Introduction

Electricity is essential for the creation of wealth and improvement of social welfare; this means an adequate and reliable supply of electricity is required to ensure sustainable development (Apeaning, & Thollander, 2013). From a socio-economic point of view, electricity plays a multifaceted role in ensuring the improvement of quality of life, an increase in productivity, and the advancement of entrepreneurial activities. Almost all developmental activities from the production of goods and services to the advancement of economic infrastructure all depend on a reliable and sustainable supply of electrical energy (Eshun & Amoako-Tuffour, 2016). The implication is that uninterrupted access to electricity is central to achieving sound economic development in every country. As part of its policy plan, the United Nations' Sustainable Development Goal 7 has emphasized access to affordable, reliable, sustainable, and modern energy for all countries by 2030 (Report of the Secretary-General, 2019). This makes electricity a sine qua non to the development and economic growth agenda of all countries. As a developing country, Ghana has experienced severe electricity supply challenges in the past decade, which has created a wide development gap in the country's economy. Eshun & Amoako-Tuffour (2016) have argued that the real challenge to the provision of electricity in Ghana is the capacity to ensure that access to electricity is reliable and adequate (Eshun &

Amoako-Tuffour, 2016). With an estimated population of 31072940 in 2020 according to the United Nations population data, the higher demand of electricity has become a major problem to respective governments in their efforts to build a sustainable and resilient power hub to cater for the incessant power demand (Eshun & Amoako-Tuffour, 2016; United Nations, Department of Economic and Social Affairs, Population Division, 2019).

The political history of Ghana has a far-reaching impact on the country's economy. The energy sector has since the colonial era been impacted greatly by respective governments since independence. Various governments have implemented several policies to manage Ghana's Electricity Supply Industry from the colonial to the post-independence era. Botchway's (2000) briefing of the political underpinnings of Ghana's Electricity Supply shows that there has been a radical shift of policies due to how various governments assumed power (Botchway, 2000). Perhaps this may have contributed to the numerous challenges the country faces concerning supplying reliable power and also the lack of investment in the energy industry since 1966. The production of electrical energy in Ghana dates back to the Gold Coast era where diesel generators owned by factories and mining establishments served as the major source of electricity supply (Kumi, 2017). This was the colonial government's setup; to run a diesel generator power hub with no laid down policy to implement any rigorous energy program (Botchway, 2000). After independence, Kwame Nkrumah set up a seven-year policy plan for national reconstruction development (Adu-Gyamfi et al., 2019). Adu-Gyamfi (2019) have emphasized that science and technology have always been part of the revolutionized vision of Ghana's national policy since independence. In the energy sector, Nkrumah started the construction and the completion of the first hydro-electric plant in 1965 to generate electricity for all the people throughout the country (Brew-Hammond, 1996). Ghana's electricity sector since then has been heavily dependent on the Akosombo Dam for the supply of electricity throughout the country (Kumi, 2017).

The Electricity Department under the Nkrumah government was later absorbed by the newly established Electricity Corporation of Ghana under the Busia led administration in 1967 (Botchway, 2000; Brew-Hammond, 1996). Between 1972 and 1975, negotiations for the export of power to some neighboring countries including Togo and Benin was completed (Botchway, 2000). In 1983, the 'revolutionary' government led by Rawlings as part of its policies to ease the pressure on ECG, which was already undergoing restructuring due to an economic breakdown from the 1970s, introduced the Economic Recovery Programme (ERP) (Brew-Hammond, 1996). The ERP was committed to providing universal access to electricity to all areas in the country including the northern region of Ghana (Brew-Hammond, 1996). From 1990, two institutions have been tasked with the responsibility of providing electricity throughout the country; the Volta River Authority (VRA) and Electricity Corporation of Ghana (ECG) (Jacobson, & Delucchi, 2011; Alhaji, 2015). The VRA supplies electricity to all areas in the country including the then Northern and Upper

Regions while the ECG distributed power to some areas in southern Ghana which are considered outside the national grid (Botchway, 2000).

A close examination of the historiography and a broad spectrum of existing literature shows that there is a growth of scholarship surrounding energy production in Ghana, however, a detailed analysis of those data shows that there is much left to be discussed. One of the areas that need further exploration due to its dearth of knowledge is the means through which electricity was generated and used in Ghana, particularly in the two former industrializing cities, Accra and Kumasi from 1900 to the 1960s. In his work, “The State, Governance, and the Energy Industry in Ghana” Botchway (2000), examined the extent to which the state and its principles of good governance have contributed to the efficiency or otherwise of the energy industry. This article pays attention to the political underpinnings of energy production with less focus on how social activities impact the generation of electricity in Ghana. Hagan’s (2015) work “Renewable energy policy review, identification of gaps and solutions in Ghana” identifies the challenges that plague the energy sector and recommends privatization and consideration of a more enhanced mechanism in adopting renewable energy technologies to solve the woes of energy production in Ghana. Similarly, Kumi (2017) in his study “The electricity situation in Ghana: challenges and opportunities” posited that the government of Ghana should prioritize the use of renewable energy resources to compliment the smaller hydropower plant to ease the heavy dependence on the Akosombo dam and the major thermal generation facilities. The role of science and technology including the use of renewable energy technologies in helping achieve economic advances, education, infrastructure, and improvements in all sectors including electricity self-sufficiency has been emphasized by Adu-Gyamfi (2019) in their seminal work “Science, technology and healthcare delivery in Ghana: A historical perspective”. However, in considering such a model, the analysis in this study shows that more efforts will be needed at the grass-root level to ensure reliable and universal access to electricity (Adu-Gyamfi et al., 2019). Apeaning & Thollander (2013), also aiming at enhancing the knowledge of industrial energy efficiency and management strategies in Ghana, have investigated the present level of energy (and efficiency) management practices in Ghana’s largest industrial park, the Tema industrial area. In this study, Apeaning and his contemporaries, gave a fair idea of the production and usage of energy in Ghana, focusing on a latter period. Several of these studies as already stated in the foregoing review among others have paid little attention to the historical foundation of the generation and management of electric power in the colonial Gold Coast, particularly in Accra and Kumasi. This is the gap this study seeks to fill.

The paper explores the various means in which energy was maximized from 1900 to the 1960s. It highlights the pertinent issues and processes that culminated into the building of the first hydroelectric dam to produce electricity in Ghana. The study is further guided by some objectives including the need to ascertain the difference in the implementation of policies on energy production in Accra and

Kumasi, to highlight the means through which the people in these areas generated and used electricity and examine the discourse on the various sectors that are involved or concerned about the use of power in Ghana.

Methodology

The study reviewed the energy culture in late colonial Ghana by extensively exploring various means in which selected big towns and cities implemented energy policies, and the various means they provided energy for themselves up until the era of independence. This study was purely based on qualitative research. Qualitative research is discovery or exploratory research, which is used to gain an understanding of thoughts, opinions, and sometimes, motivations. It delves deeper into the problem or helps develop ideas or hypotheses for potential quantitative research (Wyse, 2011). The nature of the study demanded the use of archival materials. These essential materials were obtained from the national archives of Ghana, known as Public Records and Archives Administration Department (PRAAD) which is located in Accra and also the Manhyia Archives located in Kumasi. The type of archival materials obtained were in the form of minutes, correspondences, reports, public annual electricity reports by government and colonial officials, and unpublished records. Since the period under study covers 1900–1960, there was the need to use correspondences between colonial officers and administrators as well as documents on the post-independent government of Ghana.

Apart from the archival materials which provided some data, information was obtained from libraries and internet sources to augment and corroborate the primary material retrieved from the archives and vice versa. Figures on production and use of electricity were accessed from various sources – secondary and primary – an example is the use of archival sources to generate tables and figures to ascertain the pattern of electricity production. The information gathered was analyzed using a narrative approach.

Discussion

The paper has been structured into four sections. The first section focuses on the introduction which has already been discussed; it includes the method of the study. The second section focuses on a critical appraisal of related and existing scholarship. The third section covers data analysis and discussion. The fourth section focuses on the history of electricity generation in Ghana focusing on two cities; Accra and Kumasi.

Energy, Energy Production and Usefulness

Referring to Herbert (1956), Adu-Gyamfi et al. (2017) argued that nuclear energy is produced when nuclear fissions react against each other. It is from this reaction that energy is produced (Adu-Gyamfi et al, 2017). According to the study, a mix of energy production and distribution in Ghana will be a probable way to curb the energy crisis that continues to plague the country. They argue that nuclear

energy should be added to Ghana's energy mix (Adu-Gyamfi et al., 2017). They argued further that nuclear energy is cheaper, reliable, and durable than energy produced from gas and coal. "Comparing nuclear energy to natural gas has shown that one kilogram of uranium can illuminate fourteen 100-watt light bulbs for ten years. With the same amount, natural gas and coal can light the equal number of bulbs for only ten and six hours respectively" (Adu-Gyamfi et al., 2017). The issue at stake would succinctly include why Ghana has hesitated to implement her Nuclear Energy policy which was signed in 1961? According to Adu-Gyamfi et al. (2017), the Kwabenya Nuclear Reactor Project (KNRP) aimed at achieving some key targets including the introduction of nuclear science and technology, the development of the infrastructure for nuclear power programme and the need to acquire nuclear technology to provide sufficient electricity for industrialization (Adu-Gyamfi et al., 2017).

Jäger et al. (2016) have argued that electricity can be produced from the energy from sunlight, called solar energy. Direct conversion of this type of energy to electricity is based on semiconductor materials called photovoltaics (PV) (Jäger et al., 2016). Hagan (2015) argues that solar energy's might and capacity in Ghana ranges from "4.5 to 6.0 kWh/m²/day with the highest irradiation levels occurring in the northern half of the country" (Hagan, 2015). The solar potential is highest in the Northern Region but the electrification rate is low (Solar Energy, 2018). However, Hagan expounds that, the government is piloting several initiatives on the deployment of solar energy systems. Significantly, solar energy is the technology used to harness the sun's energy and make it useable (Solar Energy, 2018).

According to Ahiataku-Togobo (2014), Ghana has high Wind Power potential along the coast. Data collection for 60 m & 80 m height has been underway in 13 sites (Ahiataku-Togobo, 2014). Some of the sites for high voltage wind energy include Kue with a height of 2.9 m/s, Lolonya with 5.4 m/s, Tema with 5.0 m/s, Aplaku with 5.2 m/s, Kpone with 4.9 m/s, Oshiyie with 3.9 m/s, Angloga with 5.4 m/s among others (Ahiataku-Togobo, 2014). As asserted by Aurela (2012), "...strongest wind regime occurs along the Ghana/Togo border (9-9.9 m/s). Along the coast, high winds are also present (6.2-7.1 m/s)" (Aurela, 2012).

Hagan (2015) has argued that Ghana's primary energy is made up of 50% biomass. He further explained that the household sector consumes the highest biomass energy in the form of charcoal and firewood (Hagan, 2015). Aurela (2012) again expounds that Ghana has a suitable climate for plantation growth of *Jatropha Curcas*, which can be used for producing biodiesel, and the government of Ghana has developed a plan for such production (Aurela, 2012). Examples of biomass include supply from agricultural residues from maize, sorghum, rice, and from agro-based produce such as shea butter, cocoa, rubber and palm oil as well as saw mills (Hagan, 2015).

Spratt (2017) argues that electricity is a tool to help poverty reduction. He reports that, it is more reasonable and attainable when electricity is produced from renewable sources. Renewable energy can support low-carbon development strategies

(Spratt, 2017). Therefore, “electricity supply, access, and reliability should be prioritized if it is a key binding constraint on growth” (Spratt, 2017). Wolde-Rufael (2006) elaborates that, the supply of electricity is believed to be a requirement for Africa’s economic and social development. In his work “Electricity consumption-economic growth nexus: the Ghanaian case: Introduction”, Adom (2011) affirms that electricity is a basic infrastructural element for economic advancement. It is a multitalented ‘energy currency’ that underpins a wide range of products and services that improve the quality of life, increase worker productivity, and encourage entrepreneurial activity (Adom, 2011).

Apeaning and Thollander (2013) have also reported that majority of the funds that help finance energy in Ghana comes from indigenous businesses, a situation which will not be able to meet the increasing demand for capital which will finance energy sector development in developing countries (Apeaning, & Thollander, 2013). They postulate that there is the need to invite foreign and external capital for the growing energy demands since it will be dangerous for private capital to run out in developing countries. Given this, there is growing external fund into the energy and power sector of Ghana as could be seen from the United States Millennium Challenge Corporation (MCC), which proposed a five-year Ghana Power Compact which comes with the vision of creating a financially stable power sector which will stand the pressures at hand and also deal with future needs of households and businesses. This required the investment of an amount up to \$498 million over five years to help transform the power sector in Ghana (Investments to transform Ghana’s power sector, 2014).

The Evolution of Power Generation and Distribution in Ghana (1900-1960)

Before the advent of diesel generators owned by industrial establishments including factories and mines as well as other institutions such as hospitals and schools, there were various indigenous means of power generation (Kumi, 2017). It should be noted that this power was consumed domestically and to a lesser extent on industrial/factory bases. On the industrial sense, power was needed for cottage factories such as soap and oil palm production, fish mongering as well as smoking of game. Though the former were of high demand, the latter were demanded on small scale bases. The nature of activities in the Gold Coast in periods before colonization depicted the greater need for heat energy. Given this, firewood was of high demand among the indigenous people of the Gold Coast. Evidence of this has to do with the various firewood concessions supervised by the chiefs in the case of Asante (Manhyia Archives, 1946). By the dawn of independence, the industrial sector, modeled along that of the colonial economic system, was small (Ackah, Adjasi & Turkson, 2014). There was little or less use of power plants during this period. This is closely related to Ghana’s indigenous economy comprising of four main activities: agriculture; hunting and fishing; cottage industries and trade (Buah, 1980). The latter included weaving and cloth-making, soap-making and salt-making, small scale

mining, subsistent farming which was targeted for local trade among others. Elsewhere in Europe, industrialization started in Great Britain during the earlier periods of the mid-17th and 18th centuries (Martin, Starace, & Tricoire, 2017). This called for the need for a more sophisticated means of power generation to boost and support the industrialized economy.

Kelly (2017) argued that the Industrial Revolution in Britain introduced varying ways from which power could be generated. These included water, steam, and coal; these were believed to be abundant sources of power. He related British advancement in the textile industry during the era to her ability to explore various means of power supply. Here, Britain had considered the case of sophisticated power over manpower which dominated most means of production of European States by the dawn of industrialization. Again, electrical energy transformed the United State of America rapidly than the railway did. The gradual introduction of machines contributed to the birth of electrification and power production. The success of Ghana can also be explored from this angle, in the sense that the period preceding colonialism saw Gold Coast with a graciously weak industrial base. Even after that, Ghana took sometime before making efforts to move toward the path of industrializing states but this was truncated by political instability, intra-party and interparty conflict, poor governance and leadership, corruption as well as military coups among others. The need to industrialize requires some sophisticated power system.

Demand for Electricity in the Gold Coast

Attempts for Rural or Provincial Electrification

On 7th May 1956, The Development Committee of the Gold Coast in a meeting came out with a memorandum, which aimed at the provision of electricity for selected towns. After this decision was taken, a comprehensive scheme was drawn. Significantly, the financing of the scheme was to be done by the Local Authorities with a total cost which was not to exceed £120000. The scheme aimed at establishing eight rural electrification stations in all the regions of Ghana (PRAAD, Accra; RG. 7/1/1627). However, the initial work did not start with all the regions but there was the selection of a few. These can be viewed in table 1 below. In Ashanti Region, more than eight towns were selected, but the cabinet at the time deleted one of the towns from the list since the scheme had to cover only forty stations (Baffour, 2013). Greater Accra, which happens to be one of the regions selected to form part of the pilot study was not included in this scheme. The viable reason was that, the Greater Accra Region had its own isolated scheme designed to provide electricity.

On May 12th, 1954, the Development Committee made plans to extend the existing diesel station in Accra to 9000 kW capacity. The expansion of the diesel generating plants was not able to meet the demands of Accra and Tema which needed between 16500 and 20000 kW of power.

Table 1. Towns Selected for the Operation of the Rural Electrification Scheme on 7th May 1957 (Public Records and Archives Administration Department, file number RG.7/1/1628)

REGIONS	TOWNS SELECTED
Eastern Region	1. Akim Mansu 2. Akropong 3. Apedwa 4. Kwabeng 5. Mpraeso 6. Nkawkaw 7. Somanya 8. Suhum
Western Region	1. Abakrampa 2. Agona Junction 3. Apam 4. Asankragua 5. Awutu 6. Axim 7. Esiama 8. Half Assini
Trans-Volta/Togoland Region	1. Afloa/Denu 2. Anfoega 3. Jasikan 4. Kadjebi 5. Kpandu (sic) 6. Kpedze 7. Kpetoe 8. Worawora
Ashanti Region	1. Akrokerri 2. Bechem 3. Berekum 4. Dormaa-Ahenkro 5. Effiduase 6. Kukuom 7. Manso-Nkwanta 8. Sunyani 9. Techiman
Northern Region	1. Bawku 2. Bimbila 3. Bole 4. Damongo 5. Navrongo 6. Sambu 7. Wa 8. Yendi

Based on this, some consultation was done to investigate and design a new steam station to serve Accra and Tema (PRAAD, Accra; RG. 7/1/1627). In 1956, the scheme was suspended but the question was revisited in 1958 by the Standing Development Memorandum. The project was capable of adding additional generators up to 80 megawatts total capacity (PRAAD, Accra; RG. 7/1/1628).

Hydropower Potency of Some Rivers in the Gold Coast

The Gold Coast lies amid numerous rivers, great and small which she could tap from to meet her power/electricity needs. Therefore, in April 1957, the Chief Engineer studied some small hydroelectric schemes. There were some rivers he took into account for their suitability, and these are enumerated in table 2 indicating their hydropower strength or potential.

Table 2. Hydropower Potency of Some Rivers in the Gold Coast (Hydro-Power Schemes, Development Commission, (PRAAD) RG. 7/1/2150)

River	Location	Hydropower Score	Estimates in Kilowatt
River Pawn Pawn	Approximately 8 miles away from Koforidua	71	53.0
River Akrum	Near Begoro, 11 miles from Koforidua	41 (seasonal)	30.7
River Densu – Waterfalls	4.5 miles from Koforidua	1470	1095.0
Waterfalls	west of Mount Ejuanema and East of Nkawkaw	655 (seasonal)	493.0
Waterfalls	Near Amama, 5 miles from Mpraeso	13	9.7
River Apatosu	7 miles NorthEast of Mpraeso	22	16.2
The Birrutu Falls	9 miles from Mpraeso	136	10.5

Furthermore, under the rural electrification, which aimed at preparing several towns to access electricity based on the utilization of thermal generation; it was noted that it will be more economical and less time and resource consuming. Extending some of the electricity supply to some of the towns that were situated near or within a

reasonable distance of rivers with hydro-electric generation was less time and resource consuming. This view was supported by a parliamentary survey (PRAAD, Accra; RG. 7/1/2150). The towns which were selected along water or within river areas are listed in table 3. Also, table 4 shows an estimated power demand for selected cities in the Gold Coast from 1954 to 1968.

Table 3. Potential power estimate (PRAAD, 7/1/2150)

River	Potential Power Estimate (Megawatts)
Bui	65
Ajena	810
Kosombo (sic)	810
Tano	9.7
Offin	1.9
Pom Pom	3.6
Asuboni	3.4

Table 4. Estimated Demand (Public Records and Archives Administration Department, file number RG. 7/1/1627)

Area	1954	1956	1958	1963	1968
Accra	4.500	–	9.000	13.500	18.000
Tema	–	–	2.000	3.000	4.500
Kpong	–	–	–	?	?
Sekondi/Takoradi	2.500		4.000	6.000	9.000
Kumasi	1.300		4.000	5.000	7.500

Power Production Before the Akosombo Dam

The fact that no extensive electricity was produced in the Gold Coast before the construction of the Akosombo dam meant that there were hindrances. One of the greatest hindrances to the issue of energy production and management in the Gold Coast centred land. As it has been stated elsewhere in this paper, local land is held for the people by the chiefs or king. Therefore, issues arose with the procurement of sites for firewood plantations for the people of the Gold Coast. In one instance, on 23rd November 1945, the office of the *Asantehene* (King of Asante) wrote to the District Commissioner for their regret for giving the government a wrong site. The site which was approved for the firewood plantation was the property of the people of Bremang and that land was reserved for the people of Bremang and for posterity. It necessitated the need to select a new station for the plantation. This issue came into being when the *Bremanghene* (the chief of Bremang) and his councilors forwarded a petition to the office of the *Asantehene* on this matter (Manhyia Archives, MAG 1/6/4/4; No. 0013/10).

On 7th May 1956, in an attempt to electrify the region of the Gold Coast, the Development Committee of the Gold Coast argued that the cost of production should be borne by the Local Authorities. However, some native authorities could not afford their financial obligations; the committee set out a new agenda that will allow indigenes to bear the cost of wiring their homes. After the commencement of the experiment, there was a memorandum by the minister of works, which suggested among other things that it did not envisage that the consumers were prepared to pay the full fee for internal wiring of their houses. The supply was experimental and was intended to provide for the cost of running small supplies in towns and rural areas. The expected revenue from the internal wiring had to be shouldered by the Electricity Department (Manhyia Archives, MAG 1/6/4/4; No. 0013/10).

In the year 1956, the development estimates for the reconstruction of the various sectors in the Gold Coast required correction on the basis that electricity was added to the estimate. While all other issues had allocated funds, electricity/power generation had limited funding. Instead of pumping funds into electric power generation, they rather excluded it from the total estimates. This shows in many ways the lack of importance placed on energy and electricity within the period under review (PRAAD, Accra; RG.7/1/1627). Also in 1957/58, no funds were made available in the Development estimates. It is noted that the funds estimated for electricity development were limited, however, these funds were needed to increase the generating capacity and distribution systems in the principal urban centers (PRAAD, Accra; RG.7/1/1627).

Construction of The Akosombo Dam For National Electrification

Every developing country aims to reach a level of higher living standards and this dream can in many ways be achieved through sustained and cheap electricity/power. The spirit of a young Gold Coast in the early years of its birth was very high as its leaders vied to provide electricity to ensure their industrial breakthrough. According to the National Energy Education Development Project (NEED), (2016), there had been numerous attempts by the British government to build a dam for the Gold Coast. Their gaze was on the the Volta River. During the early years, the British authorities had made a lot of effort to find a bauxite reserve in their colony (NEED, 2016). Also, Kwesi Lamptey, opposition member of parliament (MP) from 1951 to 1957, asserted that the Volta River scheme was an old British government scheme. In an initial report and research by Sir Albert Kitson, head of the Geological Survey Department of the Gold Coast in 1913, he identified the hydro potency of the Volta River and came out with a way to harness and utilize the water-power and mineral resources (NEED, 2016). According the University of Ghana Resource Center for Energy Economics (2005), an amalgamation of all attempts to build the hydroelectric dam got to its peak when in the 1950s Sir William Halcrow and Partners pioneered the implementation of engineering studies and studied the construction of the Volta River by constructing a dam at Ajena in the

Eastern Region of Ghana. The tenets of the Halcrow report captured the “climate and hydrology of the Volta Basin, evaporative studies, flood control, geology, power plant design, and project cost estimates in detail” (The University of Ghana. Resource Center for Energy Economics, 2005). The Akosombo River and its surroundings provided the site for this project. However, the project was not successful.

The preparatory ground for the construction of the dam was part of the colonial masters’ attempt to keep on with their exploitative scheme. According to Kojo Botsio (Minister of Education for the Gold Coast, 1951-1957), the power was initially conceived just for the manufacture of aluminium in this country. However, when Kwame Nkrumah came, he gave a new accent and new importance to that power project. Essentially, the power was to be used for the comprehensive economic development of the country. Notwithstanding this fact, there were diesel generators available in the Gold Coast. The power from the Volta River, once generated meant all diesel equipment not required could be removed and used elsewhere as standby or to meet peak demand. It was argued among other things that, it was unproductive and uneconomical to supply smaller towns with the power from the Volta since these towns did not have strong industrial and economic demand (Development Plan General Electricity, 1954). During the process of constructing the dam and in the name of education, Kwame Nkrumah and the British Government took the Ghanaian population through a series of a traveling exhibition of the power scheme. Prototypes and models of the dam were built and taken to public places where the local Ghanaian population witnessed what the dam would look like (NEED, 2016). Due to the exhibition the project underwent, a large number of Ghanaians were very much interested in looking for ways in which they could provide support. This is affirmed by SQN. LDR Clem Sowu, assistant exhibition officer 1956 that, a farmer came to him asking which way he could be of help to speed up the construction of the dam (NEED, 2016).

It was not until after Ghana gained independence from the British in 1957, that the first black prime minister, Dr. Kwame Nkrumah launched the plan to build a hydropower plant in Ghana. In the process, he asserted that ‘I have always been convinced that an abundance of cheap electrical power is the soundest base for the expansion of industry in a country such as ours’ (NEED, 2016). From this point of view, it can be deduced that the building of the dam was geared towards the betterment of the social, economic, and political life of Ghana. Kwame Nkrumah realized this importance.

The construction of the dam took a political turn in the sense that Ghana was caught-up in the hegemonic power struggle between the Soviet Union and the United State of America. George Ball, who worked under the secretary of state during the Kennedy administration of the United State, recognized the progress the Soviet Union was making with their communist ideologies, particularly in Africa and to some other parts of Europe. Therefore, the United States countered with foreign aid

as a defense mechanism against communism, and Ghana was one of the countries to benefit from this (NEED, 2016). Ghana struck a deal with the United States of America when Dr. Kwame Nkrumah visited the country and told their leadership about the importance of the dam, its aluminum reserve, and the fact that, the best way for the construction of the dam to be a success was to bring in an American Aluminum Company. In the process of agreeing to Nkrumah's request, in 1958, a team of engineers from Kaiser Aluminum landed in Accra to take a look at the plan for the scheme (NEED, 2016). Initially, the dam was to provide huge electricity for Kaiser, in paying for the construction of the dam and the rest of this power will go into servicing the need of the people of Ghana. Another means of obtaining funds for the dam came from the World Bank when Kwame Nkrumah requested of them to offer Ghana a loan of 30 million pounds . This amount was the biggest ever asked from the World Bank at that time. Thus in 1961, "the Volta River Authority (VRA) was established by an Act of Parliament and placed directly under the Office of the Prime Minister. The Act gave VRA responsibility for generation and high-voltage transmission of electricity throughout Ghana" (Brew-Hammond, 1996). On 22nd of January 1962, Kwame Nkrumah signed the master agreement and was then completed in 1965 which came at a cost of \$200 million. The Volta Aluminum Company (VALCO) was set up to control electricity production. The Kaiser Cooperation Company run the VALCO. It employed over 1500 Ghanaians and brought precious foreign exchange into Ghana. The Kaiser cooperation used the dam's electricity and so allowed the World Bank loan to be paid off without interruption (Brew-Hammond, 1996).

The construction of the dam came with increasing industrialization in the country's economy. In 1968, Ghana's electricity demand shore up to a peak of 540 GWh (Eshun & Amoako-Tuffour, 2016). With industrialization rapidly growing in the country, more houses being erected, and the pressure on the dam at Akosombo, there were increases in generation by 1972, the generation capacity of the Akosombo dam reached 3321.23 GWh with the installation of two additional generating units (Brew-Hammond, 1996).

Power Production and Management

Electricity in Greater Accra and Ashanti

Duku et al. (2011) as well as Gyamfi et al. (2018), indicate that Ghana's primary energy sector is predominantly biomass. 64% of energy production in the country comes from biomass (Duku, Gu & Hagan, 2011). Traditional biomass comes in the form of plant/crop and dung and other wood residues (Gifty, Kemausuor & Brew-Hammond, 2013). Ghana, like any other country, started with the use of traditional energy specifically firewood. According to Evald (2013), firewood is produced from branches, smaller whole trees, etc. from the forest. It could be from whole trees and wood waste from gardens, parks, and other recreational areas, areas along railways among other places as well as from industrial surplus products and other numerous

sources. The people of the Gold Coast realised the importance of firewood, which is classified as a renewable source of energy (McKendry, 2002). The land which hosted the firewood belonged to the people communally and the chiefs held them in trust for the community” (PRAAD, Accra; Ghana 1945, ADM 5/4/18). With the advent of colonialism, the colonial administration combined efforts with the native authorities to ensure that, wood fuel was readily available to the people of the Gold Coast. The indent below draws insights on the matter:

I shall be glad to know as soon as possible whether you have agreed to the area which the Adumhene inspected, being used as a Firewood Plantation for Kumasi. If this is agreed, it will be desirable to pass Native Authority Rules, declaring it a Forest Reserve so that it can be properly managed. It is important that an agreement is reached as soon as possible so that the nursery for the trees can be started at once for planting out next year (Manhyia Archives, Kumasi, Ghana, MAG. 1/6/4/4; No 0013/10).

The period under review witnessed the passage of ordinances that demarcated areas that formally became known as firewood concessions. This was administered directly under the Native Jurisdiction Ordinance; empowering chiefs and for that matter the *Asantehene* to demarcate portions appropriately. The above correspondence gives an account of traditional and indigenous means of power generation in the Gold Coast. Vineyards and homesteads were built to store firewood for various purposes. Per the content of the correspondence, large acres of profitable lands were left for traditional energy production, especially in Asante. There was great importance placed on the energy derived from wood. Kitson (1945) argued that wood fuel has been for transportation (especially water launches), in industry, mining, and domestic purposes (Kitson, 1945). Kitson again saw the importance of wood fuel in the life of the people of the colony and mentioned that the continuous deforestation and cutting down of trees for fuel without replanting had the propensity to distract the daily lives of the people of the Gold Coast. He suggested that efficient and effective measures should be put in place to conserve and reserve the forests since there will come a time when wood fuel would be too expensive or non-existent (Kitson, 1945).

From the use of wood fuel to the introduction of stand-alone generators, the management and distribution of energy and power were done collaboratively for the local and colonial administration. The local Ghanaian population during the early parts of the 1900s used wood fuel in large quantities. Since the administration of the Gold Coast was still in the collective hands of the colonial administration and the native authorities, energy for both domestic and industrial purposes was managed by both administrations as seen in the following correspondence:

I have to inquire whether you agree with the recommendation of the Finance Board that the cost of the firewood reserve should be borne equally by Government and the Native Administration and that the profits should be shared equally (Manhyia Archives Kumasi, 1945, MAG 1/6/4/4, No.0013/12).

In 1945, the office of the District Commissioner of Kumasi reported that the headache for the cost of planting a tree and reserving them for fuel has to be shared whether equally or otherwise, by both authorities. The idea behind this phenomenon was that the Native Authority had to bear the cost for the natives who used firewood for domestic activities and to a lesser extent, to support local industry. Again, the fact that most earlier industrial activities such as mining and lumbering were in the hands of the colonial administration, they the local people could not bear the cost of maintaining the plantation reserves alone. The Kumasi Forestry Department in response demanded that the government was to accept and pay all debts. Thus, at the end of the financial year, a statement of expenditure was submitted to the Finance Board of the Kumasi Divisional Council, who was required to pay 50% of the total expenditure (Manhyia Archives, Kumasi, 1945, MAG 1/6/4/4; No 0013/27). This made sense since both the natives and the colonial administration had a stake in the usage of the firewood. Tariffs and taxes were collected from the local people for using the wood fuel from the plantation.

The introduction of the electronic means of power production came into the Gold Coast during the early period of 1900. Factories and companies who operated high-speed machinery imported lightning systems to propel their operations. The organization further stated that the Gold Coast Railway administration in 1914 operated public electricity systems which was used to support the railway systems in Sekondi as well as the management of their supplementary facilities like offices and workshops (The University of Ghana Resource Center for Energy Economics, 2005). Aside from the railways administration, another section of government that operated public lightning was the Public Works Department (PWD). In 1922, they started the operation of public electricity and provided Accra with a small scale direct current public supply of electricity. Two years later, in 1924, the PWD supplied alternating currents to Accra (The University of Ghana Resource Center for Energy Economics, 2005). On 12th May 1954, the Standing Development Committee for Electricity Development considered a memorandum on electricity for Accra and Tema. They concluded that the already installed diesel station at Accra should have an extension to about 9000 kW capacity, that steam power should be built, and that an expert should be invited to design a steam power station to serve Accra and Tema (PRAAD, Accra; RG. 7/1/1627).

The Electricity Department believed that Accra and Tema would need an estimated amount of between 16500 kW and 20000 kW before the installation of any power from the Volta. Furthermore, the department saw that a steam generating plant could be in operation in 1957–1958 and this could be more economical to operate than a diesel station (PRAAD, Accra; RG. 7/1/1627).

In earlier demands, the supply of electricity to Kumasi and the mining areas required power from the Volta leaving Accra and Tema to be served by a steam generating station (PRAAD, Accra; RG. 7/1/1627). In 1925, the installation of a small power plant made up of “three horizontal single-cylinder oil-powered engines”

was completed in Koforidua. It continued the next year in Kumasi, where in May 1927, a restricted evening supply was commenced and a power station finally started operation in October 1927 (Electricity company of Ghana. Our History, 2019). The people of Winneba received their share of the grass-root national electrification when in the same year, in 1927, a Direct Current (DC) supply was extended to them but was later replaced with Alternating Current (AC) and extended supply from Swedru which was already in operation (ISSER 2005). Efforts to supply the nation with electrical energy went further and took a different dimension when from 1929 to 1930, Tamale received a limited supply until the installation of a new AC plant was completed in 1938. According to ISSER (2005) and ECG, the works of the Public Works and Railways were handed over to the Electricity Department on 1st April 1947.

Purchase of the University College's Power System by Government of Ghana

The minister responsible for communications and Works in 1957 prepared a memorandum on Electricity Development which captured the purchase of a power station developed by the University College of the Gold Coast now referred to as the University of Ghana, Legon. According to records, the generating station at Legon had a capacity of 4000 kW and had the tendency of expanding to 9700 kW capacity and that the school was willing to sell out the station to the Government for an amount, not more than £310000 on the basis that the station was too large for the College's immediate requirements (PRAAD, Accra; RG. 7/1/1627). During the process that laid the foundation for the purchase of the station, the authorities of the University College stated terms, which were to be studied and accepted by the government. The terms stated that:

- (a) The government should take control of all installations, however, the distribution system including substations should remain the sole property of the College,
- (b) That government should not pay less than £305000 nor more than £310000 for the station subject to certification by the College's architects and quantity surveyors,
- (c) That at a fixed price, the college should be provided with bulk supply of electricity,
- (d) That the college should be prioritized ahead of other consumers and should have the first claim on all electricity generated at the station, and
- (e) That Government should provide facilities for training of the University College students in Electrical Engineering at the power station (PRAAD, Accra; RG. 7/1/1627).

It should be noted, however, that, the prices set up for the station was the actual cost of production, and also kilowatts of power generated cost of £77. The normal Gold Coast price ranged from £45-£55 per kilowatt and £60-£70 per kilowatt in the United Kingdom. However, the Legon station was constructed and equipped to be far more sophisticated than normal trends in the country. It was considered that the cost of constructing and equipping this station was a better idea (PRAAD, Accra; RG.

7/1/1627). The government of Ghana equally believed that it would be useful for the economy.

Conclusion

Electricity production in Ghana has taken many turns, starting from the era when the indigenous Ghanaian communities relied mainly and predominantly on traditional ways of energy production in the form of biomass – firewood and plant residues. This system was very instrumental in the development of indigenous industries as well as for household consumption. Cottage industries like bead-making factories, blacksmithing, pottery making, salt, and soap-making among others were reliant on such mode of energy production. It was not until colonization when glimpses of more sophisticated means for the generation of electric power was started in the country. Since it was expensive to maintain and run, it was predominantly bigger industries like the railway departments of government as well as schools that could use stand-alone power plants for their operations. By studying the evolution of power production in Ghana from the 1900 to 1960, the study reports among other things that the management and distribution of energy/power was done by a collaboration between the colonial authorities and native authorities on one hand, native authorities alone, as well as industrial establishments.

Attempts for the provision of electricity to the natives came in later when Rural Electrification Schemes were drawn up to provide power for selected rural areas in Ghana. Before the construction of the Akosombo Hydroelectric Dam for the provision of electric energy, other rivers and lakes were considered for their hydroelectric potential. The study finally highlights that the exigencies of the time, especially during the construction of the Akosombo Dam, saw Ghana's increasing tilt towards the Soviet Union and the United States of America. It can also be argued that this was possible because of Ghana's non-aligned posture.

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Аду-Гямфі Самуїл

Університет науки і техніки ім. Кваме Нкруми, Гана

Амакіе-Боатенг Квасі

Університет науки і техніки ім. Кваме Нкруми, Гана

Авуах Денніс

Іллінойський державний університет, США

Оваре Річард

Університет Саскачевану, Канада

Кванса Стефен

Університет науки і техніки ім. Кваме Нкруми, Гана

Дослідження еволюції виробництва електроенергії в Гані (1900–1960 рр.)

***Анотація.** У літературі з історії виробництва електроенергії вивчалася її еволюція як в розвинених, так і в країнах, що розвиваються і її вплив на економіку. Деякі автори заклали основи, на яких ґрунтуються інші роботи. Уважне вивчення історіографії виробництва електроенергії в Гані показує, що для поліпшення ситуації з електроенергією в Гані потрібні додаткові зусилля. Зростаючий попит на електроенергію став найбільшою проблемою стоїть перед енергетичним сектором, з часів колоніальної епохи. Відповідні уряду домоглися значних успіхів в забезпеченні надійного і універсального доступу до електрики на всій території Гани, однак такі зусилля супроводжувалися різними рівнями проблем. У дослідженні використовується якісний дослідницький підхід, що дозволяє простежити діяльність, яка у багатьох відношеннях допомогла створити стійке забезпечення електроенергією для домашніх господарств і промисловості в Гані, особливо в містах Аккра і Кумасі, в період з 1900 по 1960 роки. Дослідження було зосереджено, головним чином, на архівних джерелах, з метою з'ясувати яким чином корінні жителі Гани яка забезпечує електроенергією свою промислову діяльність і побутові цілі. Результати цього дослідження показують, що в своїй діяльності місцеві та кустарні підприємства в основному покладалися на деревину, паливо і біомасу ще до введення більш досконалих засобів виробництва електроенергії. Крім того, дослідження показало, що при знаходити власні шляхи розв'язання проблем виробництва електроенергії, розробники більше уваги приділяють поточних питань, практично не докладаючи зусиль для відстеження історичної основи виробництва електроенергії. Незважаючи на це, важливими є невеликі зусилля, які були зроблені для вивчення історії виробництва енергії, з обмеженим акцентом на епоху, що настала відразу після здобуття незалежності.*

Ключові слова: електроенергія; економічний вплив; соціальний вплив; Гана; Кумасі; Аккра

Аду-Гямфи Самуил

Університет науки і техніки ім. Кваме Нкрумы, Гана

Амакиє-Боатенг Кваси

Університет науки і техніки ім. Кваме Нкрумы, Гана

Авуах Деннис

Іллінойський державний університет, США

Оваре Ричард

Університет Саскачевана, Канада

Кванса Стефен

Університет науки і техніки ім. Кваме Нкрумы, Гана

Исследование эволюции производства электроэнергии в Гане (1900 – 1960 гг.)

***Аннотация.** В литературе по истории производства электроэнергии изучалась ее эволюция как в развитых, так и в развивающихся странах и ее влияние на экономику. Некоторые авторы заложили основы, на которых основываются другие работы. Внимательное изучение историографии и междисциплинарных исследований производства электроэнергии в Гане показывает, что для улучшения ситуации с электроэнергией в Гане требуются дополнительные усилия. Растущий спрос на электроэнергию стал самой большой проблемой стоящей перед энергетическим сектором, со времен колониальной эпохи. Соответствующие правительства добились значительных успехов в обеспечении надежного и универсального доступа к электричеству на всей территории Ганы, однако такие усилия сопровождалась различными уровнями проблем. В исследовании используется качественный исследовательский подход, позволяющий проследить деятельность, которая во многих отношениях помогла создать устойчивое обеспечение электроэнергией для домашних хозяйств и промышленности в Гане, особенно в городах Аккра и Кумаси, в период с 1900 по 1960 года. Исследование было сосредоточено, главным образом, на архивных источниках, с целью выяснить каким образом коренные жители Ганы обеспечивали электроэнергией свою промышленную деятельность и бытовые цели. Результаты этого исследования показывают, что в своей деятельности местные и кустарные предприятия в основном полагались на древесину,*

топливо и биомассу еще до введения более совершенных средств производства электроэнергии. Кроме того, исследование показало, что при поиске решений проблем производства электроэнергии, разработчики больше внимания уделяют текущим вопросам, практически не прилагая усилий для отслеживания исторической основы производства электроэнергии. Несмотря на это, важными являются небольшие усилия, которые были предприняты для изучения истории производства энергии, с ограниченным акцентом на эпоху, наступившую сразу после обретения независимости.

Ключевые слова: электроэнергия; экономическое влияние; социальное влияние; Гана; Кумаси; Акра

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