

POLICY BRIEF

# Governing Liberia's Electricity Sector Reforms: Challenges and Recommendations

Molley Okomfo Kiazolu\*

Access to electricity remains a major challenge for Liberia's economic recovery despite recent efforts by the government to reform the sector. This paper assesses the post-war reforms of the electricity sector relative to their outcomes – accessibility, affordability and the quality of electric power. The paper also evaluates Liberia's electricity sector reform by comparing it to reform in Cote d'Ivoire. The paper argues that existing reforms do not adequately address the underlying challenges facing the electricity sector. Both productive and allocative efficiencies remain low amidst excessive government influence, and investment in infrastructure is grossly inadequate compared to regional benchmarks. Presently, electricity is one of the major, if not the single largest, cost for businesses in Liberia, and less than one per cent of households are connected to the public grid. This paper offers some policy recommendations to improve efficiencies in the sector. First, that the electricity sector be restructured; the Liberia Electricity Corporation (LEC) should be reorganised as an independent economic regulator, while the Ministry of Lands, Mines and Energy (MLME) should perform the legal and social regulatory function. Second, the sector should be unbundled into power generation, transmission and distribution, and each component privatised through competition for the market. Third, that as an independent economic regulator, the LEC should adopt cost-of-service regulation to encourage long-term and sustained investment in power generation and transmission, thereby improving access to electricity.

**Keywords:** Liberia; electricity sector; governance; policy; energy

## Introduction

The electricity sector, like all sectors of the Liberian economy, was severely impacted by the country's fourteen-year civil conflict. In 2011, it was reported that Liberia had the lowest rate of access to electricity in the world, with less than one per cent of urban households connected to the public grid (Missfeldt-Ringius et al, 2011). The cost of public electricity was estimated between US\$0.43 and US\$0.64 per kilowatt-hour, dependant on the fuel price. As a result of insufficient supply, the majority of urban households relied on self-generation, mainly through the use of diesel generators, costing approximately US\$3.96 per kilowatt-hour (ibid).

Although the civil conflict was responsible for the current state of Liberia's electricity sector, the supply of public electricity before the conflict was limited to the capital, Monrovia, and its surroundings. A few county capitals and administrative towns were supplied by isolated facilities operated by the Liberia Electricity Corporation (LEC) (MLME, 2009). To a large extent, the pre-war electricity

sector reforms – especially in terms of legal and administrative arrangements – inform and underpin the sector today. The current dismal performance of the electricity sector has serious implications for Liberia's economic recovery. The 2014 Doing Business report highlights electricity as a major cost driver to businesses in Liberia and, according to the report, it takes 365 days for a business or an average household to obtain a permanent electricity connection (World Bank, 2014).

Since the end of the conflict in 2003 and election of a democratic government in 2006, several measures have been taken to address the country's electricity challenge. This paper explains and assesses the outcomes of the key measures undertaken in the electricity sector by evaluating post-reform improvements in terms of access to electricity, affordability and quality of service, and by contrasting Liberia's electricity reform with that of Cote d'Ivoire. Cote d'Ivoire has been chosen because it is often cited as a success story in electricity sector reform in Sub-Saharan Africa and, like Liberia, it has a history of civil unrest which provides a useful base for comparison.

The paper is organised in the following way; section one gives an overview of the electricity sector and highlights the key challenges. Section two explains the measures taken to address these challenges. Section three provides

\* Ministry of Finance and Development Planning, Government of Liberia  
[molleyokomfokiazolu@gmail.com](mailto:molleyokomfokiazolu@gmail.com)

an assessment of the outcomes of these measures, and section four contains recommendations for improvement. Section five provides the summary.

### Overview of Liberia's electricity sector

Prior to the civil conflict in 1989, the country's national electricity utility company, the LEC, was the major supplier of public electricity with a capacity of 191 megawatts (MLME, 2009). This amount constituted less than 50 per cent of the total demand for electricity at that time. Due to the inability of the LEC to meet demand, the majority of the country's electricity supply was generated privately by mining, agricultural or other concession holders (MLME, 2009). The total amount of electricity generated by the LEC was enough to service only 35,000 households, which was less than 13 per cent of the total urban population (Missfeldt-Ringius et al, 2011).

The beginning of reform in Liberia's electricity sector can be traced to the establishment of the LEC in 1973. Before then, electricity was supplied by the Public Utility Authority (PUA), which was also responsible for water and telecommunications, including the country's broadcasting system (Missfeldt-Ringius et al, 2011). The PUA was, subsequently, divided into three corporations, one of which was the LEC whose mandate was to generate, transmit and distribute electricity. The Ministry of Land, Mines and Energy (MLME) became the sector ministry for the entire energy sector, including electricity. However, according to the 1973 Public Utilities Authority Law, the LEC had no managerial responsibility to the MLME, which made it a *de facto* self-regulated utility (MLME, 2009).

Although the LEC is formally recognised as an autonomous agency, separate from the MLME, the Minister for the MLME is a statutory member of the LEC board of directors. The other statutory board members include the finance and justice ministers. The entire board of directors is appointed by the President and can be dismissed by the President. This, in effect, makes the LEC less autonomous and prone to government interference given that the board of directors retains both administrative and regulatory oversight of the LEC.

The main sources of electricity have been the Mt. Coffee Hydro Plant, generating about 63 megawatts during the rainy season and 5 megawatts during the dry season; heavy fuel oil (HFO) thermal plants, generating 31 per cent of the total electricity supply; and diesel plants, generating 21 per cent (Missfeldt-Ringius et al, 2011). The LEC also operated ten facilities outside Monrovia before the civil conflict, but given the inability of the LEC to supply the entire country, private electricity generation by major concession companies was allowed to compensate for the shortage (ibid).

In addition to capacity constraints, the LEC also faced administrative challenges in terms of technical and marketing inefficiencies. Losses, due to technical and commercial inefficiencies during the period 1979–1984, accounted for 34.8 per cent of LEC total losses (Missfeldt-Ringius et al, 2011). Technical losses were attributed to the LEC's inability to conduct routine maintenance and

repair of facilities, while the commercial losses were due to factors that included illegal connections, inability to enforce service disconnection, failure of public institutions to pay electricity bills, and most importantly the setting of electricity tariff below the marginal cost. As a result, the LEC became inefficient and heavily indebted. During the financial year 1983–84, for example, the LEC supplied electric power to a total of US\$47.4 million but was only able to collect a little over US\$23.7 million (ibid).

By the end of the civil conflict in 2003, the bulk of the electricity infrastructure – including transmission lines and the Mt. Coffee Hydro Plant – was destroyed. Recognising the challenge this posed to post-war economic recovery, the government initiated an emergency power programme to light the streets, supply government institutions, schools, hospitals, and target urban residents. Thanks to funding from donor institutions, since 2006 six small grid diesel stations have been constructed and the LEC has been able to resume operations (Missfeldt-Ringius et al, 2011). The emergency power programme did not address the pre-war challenges, however, especially the weak managerial capacity of the LEC, excessive government influence and inadequate investment in infrastructure. Therefore, in 2010, the government of Liberia, with technical assistance from the International Finance Corporation (IFC), signed a management contract with Manitoba Hydro International (MHI), a Canadian firm. The MHI-LEC management contract allowed the Canadian firm to take over the operation of the LEC and, to date, this reform, which is explained and assessed in the next sections, remains the most important post-war structural reform of Liberia's electricity sector.

### Reforms to Liberia's electricity sector

Electricity sector reforms are driven by several factors. In developed countries, for example, the immediate drivers of reforms have included the increased capital cost of electricity service following the 1970 oil crisis and the existence of excess capacity of utilities. In developing countries, reforms are largely driven by the poor performance of state-run electricity companies (Kessides 2004). There are several approaches to electricity sector reform currently identified in the literature. For example, Joskow argues that electricity sector reform is the creation of wholesale spot and forward markets for electric energy and ancillary services (Joskow, 2008: 513), and Kessides notes that there are a variety of ways to restructure the electricity market dependant upon the degree of competition (Kessides, 2004: 144). Gomez-Ibanez and Bacon provide further alternate views (Gomez-Ibanez, 2003, Bacon, 1995), however, according to Y-F Zhang et al, electricity sector reforms can be classified as either restructuring, privatisation or regulation (Zhang et al, 2008). Restructuring is the unbundling of an existing electricity monopoly into generation, transmission and distribution to introduce competition. Privatisation entails private participation or ownership of state-owned utilities, and regulation is the establishment or use of regulators to attain economic efficiency in infrastructure that involves the setting and

enforcement of rules by a government agency in an effort to address market and/or regulatory failures. The main objective of regulation is to achieve economic efficiency and other social objectives set by the government (Fallon et al, 2014).

Using Zhang's framework, and given the level of private sector involvement, Liberia's electricity sector reform can best be described as a form of privatisation (Zhang et al, 2008). Privatisation, or private participation in the electricity sector, is attained when private firms are involved in capital investment, asset ownership, commercial risk sharing, or the management of the utility company (Estache and Wren-Lewis, 2010). A management contract between the Government of Liberia and MHI is an example of the privatisation strategy adopted by Liberia. According to Kirkpatrick and Parker, a management contract, as a form of privatisation, is when a private entity is given the exclusive right to take over a state-owned enterprise for a given period (Kirkpatrick and Parker, 2004). One way to implement a management contract in the electricity sector is to allow private firms to compete for the right to own, operate or manage the state-owned utility (Dnes, 1995). In this way, the firm with the best proposal to improve the productive and allocative efficiency of the utility is given the right to operate (Church and Ware, 2000).

In the Liberian case, private participation in the electricity sector started when the government, through the IFC, invited bids from private firms to manage the LEC and the outcome of the process was the contracting of MHI of Canada. Other firms that bid along with MHI were NTE of Norway and Siemens of Germany (IFC, 2013). The decision to go for a management contract instead of full privatisation or divestiture was partly due to the unwillingness of private firms to take a broad commercial risk given the fragile economic environment in Liberia. Moreover, it seems that the government was unwilling to fully privatise the electricity sector given the political sensitivity of such reform. The management contract, which was facilitated by the European Union, Norway, USAID and the World Bank, provided an initial amount of US\$53 million for MHI to expand the electricity distribution system and improve services in Monrovia and its surroundings (IFC, 2013). The contract was initially signed for five years but has since been extended. The extended version includes provision for MHI to oversee the construction of the Mt. Coffee Hydro Plant. Specific terms of the management contract include training of LEC staff, facilitating additional investment in transmission infrastructure and generation, building the LEC's capacity to effectively execute its regulatory function, and developing a financial model for tariff calculation (ibid).

### **Assessment of Liberia's electricity sector reform**

This paper adopts a two-pronged approach in assessing Liberia's electricity sector reform. First, the reform in Liberia's electricity sector is assessed based on its outcomes. That is, to what extent the reform has contributed

to improving access to electricity, affordability of electricity and the quality of electricity service. Second, the overall reform process in Liberia's electricity sector is contrasted with more successful electricity sector reform in Cote d'Ivoire.

#### ***Accessibility, affordability and quality of service***

Assessing the outcomes of infrastructure reform, especially in developing countries, is a difficult task. This is mainly due to limited information, inaccurate data, methodological differences and sometimes the issue of sample bias (Megginson and Netter, 2001). Moreover, different performance indicators and criteria are often used to measure a single reform outcome. For example, Zhang et al highlight the improvement in electricity generation as a key performance indicator for assessing electricity sector reform (Zhang et al, 2008: 7). Similarly, Brown et al suggest that the performance indicators of infrastructure reform can be classified as efficiency indicators, quality of supply indicators, financial performance indicators, capacity, investment and maintenance indicators, price indicators, competition indicators and social indicators (Brown et al, 2006). However, in this paper, accessibility, affordability and quality of electricity service are the three criteria used to assess Liberia's electricity sector reforms, given that the cost and access to electricity are the main challenges facing Liberia.

One objective of the MHI-LEC management contract was to improve access to electricity in Monrovia and its surroundings. The World Bank defines access to electricity in term of the proportion of the population connected to the public grid. Prior to the signing of the management contract, in 2010, electricity supply was limited to 450 customers and a few street lights (IFC, 2013). Since implementing the management contract in 2010, more than 75,000 people now have access to electricity in Monrovia. Further, post-tender peak load has doubled, while fuel efficiency has increased by 33 per cent and generation capacity has also doubled to 20 megawatts (ibid: 2). Although this is an improvement over pre-reform performance, it is inadequate, especially when compared to the regional average performance; 53 per cent of West Africans are estimated by the African Development Bank to have access to electricity.

In addition to the improvement in efficiency and increase in service connection, there have been further investments in transmission infrastructure as well as in power generation. This is particularly important because it substantiates Joskow's assertion that the level of investment in generation, transmission or distribution infrastructures should improve after the introduction of private participation (Joskow, 2008). In this regard, US\$30 million is expected to be invested annually in transmission and distribution facilities in Liberia. Further, MHI is currently overseeing the construction of the Mt. Coffee Hydro with funding from the governments of Liberia, Norway, Germany and the European Investment Bank (IFC, 2013). According to an official announcement by the Liberian government, the Mt. Coffee Hydro is expected

to begin operations in 2015 and, when completed, it will generate 78 megawatts during the rainy season.

One feature of the MHI-LEC management contract is the provision that mandates the LEC to purchase power from the Mt. Coffee Hydro at a rate reflecting cost of production as though the construction of the hydro is financed privately. This is important because it makes future separation of electricity generation from transmission easy and hence provides incentive to increase power generation. This point will be further elaborated in the following section. There are also plans to import power from neighbouring countries under the West African Power Pool (WAPP) programme. This is important for rural electrification given that the majority of the transmission infrastructures to be constructed under the WAPP project will be done in the counties. Nevertheless, it is worth noting that the current WAPP low-voltage cross-border electrification and the Cote d'Ivoire-Liberia-Sierra Leone-Guinea (CLSG) transmission interconnection projects are proceeding at a slow pace.

The next issue is affordability; whether the average Liberian, without any adverse impact or additional cost, can use the service. The electricity tariff is a major consideration when assessing affordability given that the tariff reflects the opportunity cost to service users. Prior to the civil conflict, Liberia's electricity tariff was divided into five levels based on customer types and consumption. The tariff for residential consumers was set at US\$0.043 per kilowatt-hour just before the war, in 1989, while government entities, including embassies, were charged US\$0.064 per kilowatt-hour (Missfeldt-Ringius et al, 2011). The tariff rate was determined on a cost-of-service basis, although some costs such as depreciation and debt servicing were not included in the calculation of total cost (Missfeldt-Ringius et al, 2011). Since the tariff was not determined on a true cost basis, it was frequently changed. The frequent change of tariff was also attributed to the lack of an automatic adjustment mechanism, for example, that links the tariff rate with fuel price – one of the major cost drivers (Missfeldt-Ringius et al, 2011).

Under the management contract, the LEC's board retains the right to determine the electricity tariff. However, instead of having multiple tariffs, LEC now operates a single tariff system. The current tariff is set on the basis of the revenue needed to cover expenses and capital costs. The main cost drivers considered in determining the tariff rate are equipment cost, LEC administrative cost, 20 per cent adjustment for technical and non-technical losses, and a US\$0.02 per kilowatt-hour adjustment for operation and maintenance costs (Missfeldt-Ringius et al, 2011). In 2011, the tariff was set at US\$0.48 per kilowatt-hour. This tariff, by all indications, is currently not affordable especially when the income of an average Liberian family is taken into consideration. For example, given a household income of US\$ 1 per day, a consumption of 50 kilowatt-hours per month will cost US\$24 per month. According to Foster and Pushak, a tariff below US\$0.20 per kilowatt-hour is the affordable range for an average Liberian household (Foster and Pushak, 2011). Moreover, the existing

tariff is almost three times the average electricity tariff in Sub-Sahara Africa, which is US\$0.18 per kilowatt-hour (Missfeldt-Ringius et al, 2011).

The high tariff is basically due to the high cost of power generation. Currently, the LEC uses diesel generators to generate power, which are more expensive than other sources such as heavy fuel oil and renewable energy. Most neighbouring countries, including Cote d'Ivoire, use hydroelectric power and heavy fuel oil as the main source of power generation. This problem requires investment in HFO and renewable power generation that can best be attained through private sector participation. However inviting private participation often raises concerns for consumer exploitation through higher tariffs. This raises the argument for the establishment of an independent regulator, discussed below.

The quality of electricity service is often understood in term of the frequency of power cuts, the stability of the power and the management of congestion. In this regard, a few gains have been recorded since the signing of the MHI-LEC management contract. Specifically, the duration of daily power supply has increased from less than 8 hours per day to 24 hours (Foster and Pushak 2011). In addition, the frequency of blackouts has decreased significantly. LEC's revenue collection ratio has increased to 93 per cent since MHI took over compared to the pre-war collection ratio of 50 per cent. The improvement in revenue collection is attributed to the policy of upfront fee payment. In addition, technical and commercial losses are said to be around 25 per cent compared to 34.8 per cent before the civil crisis (Foster and Pushak, 2011, Missfeldt-Ringius et al, 2011).

#### ***Comparison with electricity sector reform in Cote d'Ivoire***

Cote d'Ivoire has been chosen as a study to compare with Liberia to identify what has been achieved in other similar jurisdictions and what lessons could be learned. Although Cote d'Ivoire has not unbundled its electricity sector – a strategy that is recommended here for Liberia – it has encouraged private participation and, by doing so, has been able to increase power generation and improve access to electricity. In contrast to Liberia, Cote d'Ivoire started its electricity sector reform by allowing private participation through competition for the market (Traore 2013). The Ivorian reform started with the establishment of the Ivorian Electricity Company (CIE) in 1990. The CIE was given concession rights to purchase, transmit and distribute electricity, and with the establishment of the CIE the government signed a contract in 1994 with a private firm, the Ivorian Electricity Production Company (CIPREL), for the construction, operation and transfer of a 200-megawatts thermal plant (Traore 2013). Since then, the government has used competitive bidding to construct additional facilities, including the 300 megawatts Azito project in 1997 (Malgas and Eberhard, 2011).

In Cote d'Ivoire, national regulatory authorities were established immediately after the privatisation of the sector. The main regulatory bodies were ANARE, SOGEPE and SOPIE (Malgas and Eberhard, 2011). Unlike Liberia, where the LEC board determines the tariff, none of the regulators

in Cote d'Ivoire was involved with tariff setting. The role of ANARE was to protect consumers by mediating between power producers and consumers. SOGEPE and SOPIE were set up to oversee the technical and financial operations of the sector and relied on the contracts with power producers to regulate the sector (Malgas and Eberhard, 2011). As a result of government non-interference in the daily operation and management of the sector, the electricity sector in Cote d'Ivoire has performed relatively well (Malgas and Eberhard, 2011).

Some notable outcomes of electricity reforms in Cote d'Ivoire have been an increase in the access rate to 74 per cent and a significant reduction in electricity sector debt (Traore, 2013). In addition, Cote d'Ivoire is a net exporter of electricity to Benin, Togo, Burkina Faso, Ghana and Mali (ibid). Power costs in Cote d'Ivoire are estimated at US\$0.11 per kilowatts-hour compared to US\$0.48 in Liberia. According to Traore, a key driver for Cote d'Ivoire's success has been the take-or-pay clause in most power contracts where the seller guarantees to supply and the buyer guarantees to pay for a minimum quantity, irrespective of the buyer not taking delivery (ibid). Private producers are also given tax exemption and government protection exists against investment risk.

Although Cote d'Ivoire's electricity sector is performing relatively better than Liberia's, a few challenges have been noted. For example, there have been instances of contract termination due to the failure of developers to secure funding for construction (Traore, 2013). Moreover, access to rural electrification remains low in Cote d'Ivoire. Even though the condition of rural electrification is better than Liberia, only 18 per cent of rural residents have access to electricity in Cote d'Ivoire (Missfeldt-Ringius et al, 2011). This is alarming given the level of progress Cote d'Ivoire has made in reforming the electricity sector.

### **Recommendations**

The low access rate to electricity, high cost of electricity, and the likelihood of excessive government manipulation remain major reform challenges for Liberia's electricity sector. These challenges, coupled with other broad macroeconomic and overall governance failures, precipitated the establishment of the MHI-LEC management contract. The existing MHI-LEC management is definitely a positive step in improving the current state of the electricity sector but, although it provides the foundation for more comprehensive reforms in the sector, it does not address long-term challenges, especially when the MHI-LEC management contract is over. As a result, more comprehensive reform is required if significant gain is to be realised. The obvious starting point would be the restructuring of the sector. The sector should be unbundled, and the role of the LEC as regulator should be separated from that of supplier.

#### ***Separate power generation from transmission and distribution***

The first phase of the reform process is to consider restructuring the entire electricity sector in line with acceptable practice. Here, the recommendation is to separate power

generation from transmission and distribution. This will require tremendous efforts including detailed empirical analysis on expected outcomes, stakeholder engagement and, in some circumstances, repeal of existing laws. However, the objective of this paper is to provide broad policy directions and justify why they are necessary for improving the overall performance of the electricity sector. The 1973 legislation that established the LEC created a vertically integrated power sector with the LEC as the only public operator. This system is yet to deliver the many positive gains associated with vertical integration. As already indicated, both allocative and productive efficiency remain low. The cost of electricity is practically unaffordable while access in Liberia is the lowest in the region.

The existing arrangement allows the LEC to set tariff and at the same time be the sole provider of public electricity. Such an arrangement can lead to conflict of interest and has the ability to seriously undermine the long-term viability of the sector by discouraging investment in infrastructure (Kessides, 2004). One way to begin the restructuring of the LEC is to repeal or amend the 1973 Act thereby allowing the LEC to either assume an exclusive commercial role as service provider or to perform an independent regulatory function. If the policy decision is for the LEC to be a power producer as opposed to regulator, then an independent power authority will have to be established to regulate the sector.

#### ***Reforming the LEC as an independent regulator***

It is recommended that the LEC be restructured as the independent economic regulator based on the following arguments. The LEC, as regulator, would have huge informational advantage given the fact that it currently serves as both power producer and regulator, and informational advantage is good for effective regulation. One major challenge to effective regulation, which can easily result in regulatory capture, is the knowledge gap between the regulator and the regulated firms. Most often the regulated firms tend to know more about the operation of the industry than the regulator. As a result, they may end up manipulating the regulator to render decision in their favour instead of serving the public interest (Dal Bo, 2006). With the LEC serving as independent regulator, the information asymmetry, or knowledge gap, can be significantly minimised, if not eliminated. Moreover, making the LEC an independent regulator will reduce the excessive government influence that most often characterises state-owned utility companies in developing countries (Stern and Holder, 1999), reduce inefficiency and solve the conflict of interest problem that is associated with self-regulation (Estache and Wren-Lewis, 2010).

Once the LEC is restructured as an independent economic regulator, the next step is to allow more private sector participation in the sector; that is, facilitating private competition. As indicated by Megginson and Netter, state-ownership is not the best solution to market failure (Megginson and Netter, 2001). Therefore an effective approach to addressing market failure in economic infrastructure is to undertake the appropriate reforms that will attract private investment and induce efficiency. Again,

there are several ways private participation in the electricity sector can be attained (Joskow, 2008, Kessides, 2004).

The recommendation of this paper is to unbundle the sector into power generation, transmission and distribution. Once this is achieved, each component can then be privatised through competitive bidding and private participation will free up government revenue for other social spending. Currently, the LEC accounts for a significant portion of government expenditure through direct budget transfers and various subsidies, including import duty waiver on fuel. With the LEC serving as independent economic regulator, the MLME can undertake the social and legal regulatory function including mediating conflict between consumers and operators. This will allow the LEC to focus on specific economic goals that are important determinants of regulatory efficiency (Veljanovski, 2010).

One challenge for Liberia is the ability to attract private participation in the electricity sector given the high level of uncertainty and unstable macroeconomic environment in Liberia. Encouraging private participation in risky ventures is difficult to achieve especially in an economy such as Liberia's where there have been significant market and regulatory failures, especially through government interference. However it is anticipated that the reform process, the repeal of the LEC Law for example, will give the LEC the autonomy required to operate as an independent regulator. This is possible given that a similar approach was taken during the restructuring of the telecommunications sector. Moreover, the awarding of contract to successful bidders will help reduce unnecessary government interference because the contract will clearly outline the role and functions of the parties involved.

Another challenge is the attainment of market competition after unbundling due to the small size of the Liberian economy. The focus should, however, be on achieving a reasonable level of workable competition instead of focusing on perfect competition. One way this can be done is for the government to serve as risk manager by giving, for example, tax incentive and guaranteeing bank credit. This will ensure that the financial risks to private firms are reduced. In its capacity as risk manager, government is able to achieve private sector implementation of projects that would not have been implemented under normal market conditions. Nevertheless, given the size of the Liberian market, a reform process that results in a single firm generating and distributing electricity may not be a bad outcome provided the bidding process is competitive. Liberia has a population of approximately four million, a huge informal economy, and a 2013 GNI per capita of US\$454.34. These realities may have implications in terms of generating the necessary market or demand that will attract private investors. Low demand is a major impediment to attracting private investment in economic infrastructure, but an increase in GDP per capita and increase in the share of the population living in urban communities is associated with higher demand for electricity inducing higher investment by utilities (Kirkpatrick and Parker, 2004: 54).

### ***Adopt a cost-of-service regulation***

The second phase of the reform basically focuses on the post-restructuring period. Here, the concern is the economic regulatory regime that will improve access to electricity while at the same time ensuring that the tariff is not too high to disenfranchise poor households. An economic regulatory regime would help ensure firms do not engage in unethical behaviour or exploit their market power by charging above marginal cost, while at the same time ensuring that enough revenue is generated to cover the cost of the additional investment needed. In particular, it is recommended that the LEC should adopt cost-of-service regulation given that the current tariff is determined on the basis of the costs incurred in providing the service. Cost-of-service regulation is likely to improve access to electricity and transmission because the firm is allowed to charge a price that is sufficient to cover the cost of providing the service (Church and Ware, 2000), and it is likely to increase investment resulting in improved access to electricity. Additional investment in power generation and transmission facilities will be attained if the LEC adopts cost-of-service regulation.

The implementation of an effective cost-of-service regulation will require capacitating the LEC to adequately review and estimate efficient cost so as to avoid cost padding by operators and unnecessary capital expenditure by firms to justify a higher tariff (Ricketts, 2005). This is a challenge and will require proper staffing and training of the LEC. However, this should not be a major problem for Liberia given that the LEC is currently using a cost of production method to derive the tariff rate. Furthermore, it is less likely that electricity tariffs in Liberia will increase beyond the existing rate because the country already has one of the highest tariffs in the world. On the contrary, any reform, especially one that increases access to electricity, should see a significant reduction in cost.

Another problem associated with cost-of-service regulation is the tendency to encourage over-investment in capital especially when the cost-of-service is determined in such a way that allows a reasonable return on capital. This situation is often referred to as the Averch-Johnson effect. However, according to Kirkpatrick and Parker, the Averch-Johnson effect is actually an advantage for developing countries like Liberia where the overriding objective is to increase access to electricity, because it encourages investment in generation and transmission facilities (Kirkpatrick and Parker, 2004). Furthermore, compared to other regulatory regimes such as the price cap and sliding-rate, cost-of-service regulation is less difficult to administer, has low threat of regulatory gaming, political capture and most importantly is more likely to be accepted by the public (ibid). This is important given the capacity constraints facing the LEC.

### **Conclusion**

Low access to electricity is a major challenge for Liberia's economic recovery. Electricity sector reforms started with the establishment of the LEC, the only state electricity utility, and prior to that, the electricity service

was provided by the PUA which was also responsible for water, telecommunications and broadcasting. Although the performance of the electricity sector was not satisfactory before the civil conflict, the war exacerbated the situation. As a result, the government introduced private sector participation through a management contract with MHI. This contract facilitated improved access to electricity, quality of service and to a large extent facilitated future electricity generation. Notable challenges remain, however, especially when the current and future electricity needs of the country are taken into consideration. Therefore, a more comprehensive reform is required to improve the sector. This paper has recommended the separation of power generation from transmission, and the restructuring of the LEC as an economic regulator. It is expected that private participation will improve efficiency, freeing up revenue for other social spending, while the restructuring of the LEC will prevent the exploitation of market power by private firms. In particular, the paper recommends that the LEC should adopt a cost-of-service regulation. This will encourage additional investment in generation and transmission thereby facilitating increased access to electricity.

### Competing Interest

The author has no competing interests.

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