Knowledge Series

Understanding the Current Non-Infrastructure Barriers to Trade in the ECOWAS Regional Electricity Market

Africa Energy Portal
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Author
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Citation

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This paper explores some of the factors behind current low trade levels and transmission capacity utilization rates in the ECOWAS regional electricity market. These non-infrastructure barriers, generally linked to electricity sector reforms, require policy and regulatory interventions.

The paper investigates non-infrastructure barriers to regional trade, and how to address them. Each of these barriers points to different gaps in the development of the electricity sector, which in turn highlights actions required from regulators and policymakers in the electricity/energy sectors in these countries.

This paper argues that many of these constraints can be addressed through market reforms, especially in countries that still operate state-run monopolies. A renewed focus and emphasis on market liberalisation at the national level, and open access in all countries will free up capacity and demand at the regional level. This will allow the flow of electricity trade and support the current on-grid demand, including suppressed demand.
Introduction

The Economic Community of West African States (ECOWAS) is one of supported Regional Economic Communities (RECs). According to 2017 figures, 51.3% of the region’s population have access to electricity, meaning that about 170 million people in the region are left without electricity access. Even part of those with access have it intermittently and unreliably. The problem is not only limited to a dearth of connections. Cross-border or regional electricity trade can be part of the solution to providing more electricity in the region. This is why the ECOWAS Regional Electricity Market (EREM) is being developed.

The value of the EREM is well recognised. Energy surpluses and low generation costs in some countries and large deficits and high costs in others make the region an appropriate candidate for regional trade, especially given its substantial renewable energy potential. The World Bank estimates that “the economic benefits of a fully integrated power market are of the order of US$5-8 billion per year for West Africa, with the potential to reduce the cost of electricity services by half in many countries in West Africa.” Additionally, analysis conducted by the Tony Blair Institute, USAID and Power Africa estimates, in the period covering 2020-2030, $30 billion in benefits through mutually beneficial power trade and the potential for large-scale regional solar development. There are significant gains to optimizing the region’s energy resources, given the varying endowments and load profiles in respective countries.

Despite the wide consensus on the benefits of regional electricity trade in the ECOWAS region, the level of cross-border trade is low. In 2018, total electricity traded in the region was 5718 GWh, representing 8.5% of its total electricity production. Of the existing interconnection transmission lines in 2017, only 42% of the line capacity was used. The number drops to 30% if we exclude electricity from Nigeria, whose distribution companies (DisCos) are facing liquidity issues thereby making exports more attractive to power producers.

A major driver to the low trade is the distant regional grid connectivity. This means that the infrastructure that will allow electricity to move from one country to another, within the region, is still being built. Indeed, the West African Power Pool (WAPP) currently has 3,916 kilometres of transmission lines under construction, while 4,569 kilometres are under preparation. While progress is being made in closing the regional transmission gap, there is still some work to be done. Furthermore, the low trade levels and transmission capacity utilization rates suggest the presence of non-infrastructure related barriers to trade in the region. The Tony Blair Institute report suggests the barriers to trade “are largely political, including non-cost reflective country to country trade agreements, non-payment, and development of costly domestic generation plants when cheaper imports are available.” These barriers are related to soft, but critical issues that need to be addressed by policies and reforms in the sector.

This paper explores some of the factors behind the low trade levels and transmission capacity utilization rates in the ECOWAS regional electricity market today. A few of these factors include technical constraints, supply availability, political willingness driven by energy security concerns, financial constraints, and issues related to transmission pricing. These barriers are generally linked to issues around sector reform, and thus require policy and regulatory interventions. While WAPP and ECOWAS Region Electricity Regulation Authority (ERERA) are making steady progress in infrastructure projects and the development of the regional market, it is important that they also pay close attention to the development of the electricity sectors in member states. The regional market could significantly benefit from WAPP and ERERA strengthening their connections with member states by supporting their regulatory and infrastructure development. This bolsters regional collaboration and cooperation. A lot more strategic capacity building is required. This will strengthen the local capacity of energy actors, helping to reduce or remove the existing barriers to trade in the regional market today.

This paper provides an overview of the regional electricity market and its constituent institutions. It then examines the current electricity trading activities in the region as well as the diverse constraints to cross-border trade. The paper reveals that a major bottleneck to cross-border electricity trade is related to a lack of market reform.
The West African Power Pool (WAPP) is set up to be the regional power system operator/dispatcher that manages the electricity flow across 14 out of the 15 ECOWAS Member States. They are Benin, Côte d’Ivoire, Burkina Faso, Ghana, Gambia, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo, and excluding Cabo Verde. As of October 2019, WAPP had 35 utility companies as members, up from 26 in 2015 and 15 at its inception in 2006. It shows the steady growth and progress that is being made in the regional market.

The main goal of WAPP is to create a successful regional electricity market that facilitates the reliable and affordable supply of electricity to ECOWAS citizens in the medium to long term. On 29 June 2018, the Regional Electricity Market was formally launched, a major milestone in the work of WAPP.\(^8\)

In December 2018, technically supported by Tractebel Engie and financed by the European Union, WAPP approved an update to its 2012 master plan – the ECOWAS Master Plan for the Development of Regional Power Generation and Transmission Infrastructure 2019-2033. This updated Master Plan addresses the evolving energy landscape in West Africa, with emphasis on integrating renewable energy and mitigating the current energy challenges facing the region. The focus of the new Master Plan is to provide the basis for priority investments in the region and has been developed to meet three overarching objectives:\(^9\)

1. The optimal integration of the variable renewable energy sources in West Africa, taking into account economic, environmental and technical constraints;

2. The development of infrastructure necessary to operationalize the market in West Africa;

3. The need to guarantee security of supply in the short, medium and long-term, taking into account the needs in terms of electrical energy and constraints related to the generation (especially variable renewable) and the transmission (sometimes over long distances) of electricity.

The WAPP Information and Coordination Centre (ICC) is in the process of being operationalized and will serve as the main hub for data collection, analysis and publication of information pertaining to the regional market. It will evolve to become the Independent Systems and Market Operator as its capacity is built to synchronise the operations of the power pool.

The ECOWAS Region Electricity Regulation Authority (ERERA) is the regulator of the regional cross-border electricity trade and interconnections in West Africa. Established by ECOWAS member states in January 2008, it provides support to the national electricity regulatory bodies of member states.

ERERA and WAPP have issued market rules and are in the process of enabling enforcement. Specifically, WAPP has commenced the registration of market participants, who must follow the market rules and procedures it has developed. This is part of its evolution into a regional systems operator as the regional electricity market develops.

The WAPP and ERERA have been making steady progress towards their objectives. However, the success of the regional market is highly interlinked with the success of its individual member states in developing their electricity supply sectors.

**Overview of The Regional Electricity Market**

Currently, trade in the region occurs through bilateral contracts between buyers and sellers of electricity. Depending on the market structure of the country, buyers and sellers can either be private or public utilities, unbundled or vertically integrated utilities. The regional regulator, ERERA, and WAPP currently play very little roles in these contracts. WAPP may sometimes come in as an advisor on issues related to transmission, technical opinions and may take part in contract negotiations. Membership in WAPP provides access to the regional network of utilities and IPPs operating at the regional level. Other than that, current transactions are handled between the two trading parties.

To illustrate, if the utility in Burkina Faso, SONABEL, intends to import electricity from Ghana, SONABEL will have to go to Ghana and find the power producer that will supply it with energy, sign the contract with that power producer as well as the transmission service...
provider who will deliver that electricity. Unfortunately, this means that many of the bilateral contracts are often signed without following a competitive process, making the power procurement process more expensive than it might otherwise have been. A centralised market platform towards which WAPP is working will avoid such issues.

The regional market is in Phase 1 of its development whereby trade is conducted via bilateral contracts. In this phase, the focus is largely on the development and implementation of dispute resolution procedures, the development of infrastructure to facilitate electricity delivery across the region and the standardisation of contracts for bilateral trading. In 2017, ERERA adopted and published model long term and short-medium term bilateral contracts. This will help to streamline the market. ERERA is focusing on enhancing the regional market through the implementation of Regional Electricity Market Rules, and is pushing for current bilateral contracts to be compliant with the model contract stipulated in the Market Rules. In this sense, expired contracts are discouraged from being renewed along their existing format, and encouraged to be renegotiated to comply with the new model. This will allow contracting parties to participate in the regional electricity market when it becomes fully operational. These activities, as well as the registration of market participants, indicate the steady progress being made in the implementation of the regional market development framework.

In the period 2016 -2019, WAPP made some significant progress in developing infrastructure for the advancement of the regional market by commissioning the following projects:

- The 225 kV Ghana – Burkina Faso Interconnection project
- The 330 kV Ghana – Togo component of the WAPP Coastal Transmission Backbone
- 275 MW Soubre Hydropower Project in Côte d’Ivoire
- 88 MW Mount Coffee Hydropower Project in Liberia

While, the following projects are on-going and getting closer to completion:

- 225 kV Côte d’Ivoire – Liberia – Sierra Leone – Guinea Interconnection Project
- 225 kV OMVG project which involves Senegal, Gambia, Guinea Bissau and Guinea

And funding for the 22kV Guinea-Mali Interconnection Project has been mobilised.

These projects are contributing to the attainment of a key milestone of completely integrating the power systems of mainland ECOWAS Member States.

WAPP has developed and launched the 2020-2023 WAPP Business Plan, which is focused on five main objectives:

1. Develop WAPP Priority Projects
   **Focus:** Integrate renewable energy into energy mix and fully integrate the sub-region’s power systems.

2. Operationalize Regional Electricity Market
   **Focus:** Complete the WAPP ICC during the period.

3. Restructure WAPP Secretariat
   **Focus:** Reorganise to enable the secretariat better serve a more mature electricity market.

4. Implement WAPP Dark Fiber Project
   **Focus:** Deploy a Consortium Agreement and Management Company to leverage dark fiber on the transmission lines. Where dark fiber use enables proper grid management.

5. Reinforce Capacity of WAPP
   **Focus:** Reinforce human capital development of over 1,600 participants, with an emphasis on women and youth, as well as building WAPP centres of excellence.

Table 1 presents a summary of WAPP transmission and generation development projects.

Besides the significant progress being made in infrastructure projects, WAPP and the ECOWAS Regional Electricity Regulatory Authority (ERERA) have formally put in place:

- Regional Market Rules.
- Regional Market Procedure
- Regional Market Admission Form
- Regional Market Participation Agreement

As the regional market progresses to Phase 2, during which the day ahead market will be developed and WAPP will be better equipped to act as a system and market operator, some of the issues mentioned above will be
resolved. Phase 2 will look closer to an efficient regional market than the current trend of disparate bilateral contracts used to facilitate trade in the region.

**Overview of Ecowas Member States**

Although ECOWAS Member States vary in their population sizes and overall macroeconomic profiles, the region contains some of the poorest countries on the continent. This becomes a relevant factor when considering that the poorer countries are having to support state-run monopoly electricity utilities that are failing to meet rising on-grid demand. With the exception of Cabo Verde, Ghana and Côte d’Ivoire, electricity access rates are generally low across the board, with rural electrification rates suffering the most.

<table>
<thead>
<tr>
<th>Country</th>
<th>2018 Population (millions)</th>
<th>2017 % of Pop w/ Access</th>
<th>Market Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niger</td>
<td>19.3</td>
<td>13%</td>
<td>IPPs + VIU + Isolated Distribution</td>
</tr>
<tr>
<td>Liberia</td>
<td>4.7</td>
<td>21%</td>
<td>IPPs + VIU + Isolated Distribution</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>7.4</td>
<td>23%</td>
<td>IPPs + G and T + D</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>19.2</td>
<td>25%</td>
<td>IPPs + VIU</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>1.7</td>
<td>26%</td>
<td>IPPs + VIU</td>
</tr>
<tr>
<td>Guinea</td>
<td>13.0</td>
<td>35%</td>
<td>IPPs + VIU</td>
</tr>
<tr>
<td>Benin</td>
<td>11.1</td>
<td>43%</td>
<td>IPPs + G and T + D</td>
</tr>
<tr>
<td>Mali</td>
<td>18.5</td>
<td>44%</td>
<td>IPPs + VIU + Isolated Distribution</td>
</tr>
<tr>
<td>Togo</td>
<td>7.7</td>
<td>48%</td>
<td>IPPs + G and T + D</td>
</tr>
<tr>
<td>Nigeria</td>
<td>188.7</td>
<td>54%</td>
<td>IPPs + G + T + D</td>
</tr>
<tr>
<td>The Gambia</td>
<td>2.1</td>
<td>56%</td>
<td>IPPs + VIU</td>
</tr>
<tr>
<td>Senegal</td>
<td>15.9</td>
<td>62%</td>
<td>IPPs + VIU + Isolated Distribution</td>
</tr>
<tr>
<td>Côte d’Ivoire</td>
<td>25.0</td>
<td>66%</td>
<td>IPPs + VIU + Isolated Distribution</td>
</tr>
<tr>
<td>Ghana</td>
<td>28.9</td>
<td>79%</td>
<td>IPPs + G + T + D</td>
</tr>
<tr>
<td>Cabo Verde</td>
<td>0.5</td>
<td>93%</td>
<td>IPPs + VIU</td>
</tr>
</tbody>
</table>

**Table 2: Overview of Population and Electricity of ECOWAS Member States**

**Table 1: WAPP Infrastructure Projects.**

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Commissioned</th>
<th>Under Construction</th>
<th>Under Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission Projects</td>
<td>4,800 km of high voltage transmission lines</td>
<td>3,916 km of transmission lines</td>
<td>4,569 km of transmission lines</td>
</tr>
<tr>
<td>Renewable Generation Projects</td>
<td>1,290 MW renewable generation capacity</td>
<td>4,512 MW renewable generation capacity</td>
<td>910 MW, with 520MW of it renewable generation capacity</td>
</tr>
</tbody>
</table>
The generation mix in the region is predominately thermal, with roughly 70% of the region’s member states having over half their generation mix being from thermal sources.

**Sector Reform in the Region**

While discussing barriers in the regional electricity market, it is useful to consider the underlying sector reforms in the electricity sectors of the ECOWAS countries. Power sector reforms consist of regulatory reform, restructuring reform, competition reform and private sector participation reform. They play a critical role in the performance of national and regional electricity markets and aid market liberalization, thereby promoting efficiency in the sector.

Figure 2 shows a summary of the African Development Bank’s Power Sector Reform Index 2018, which shows the status of reforms in twelve (12) out of the fifteen (15) WAPP member countries. Notably, performance appears to be low across the board in private sector participation reform and restructuring reform, revealing the prevalence of state-run monopolies and low levels of private sector participation in the region.

As shown in Figure 1, apart from Nigeria and Ghana, which have fully unbundled utilities, as well as IPPs, the rest of the countries are still in one way or the other, public vertically integrated utilities. Côte d’Ivoire, though still a vertically integrated utility, has the highest number of privately financed IPPs in the region, as well as one of the most efficient utilities. In the last few years, Côte d’Ivoire has made significant progress in the implementation of its power sector reform program, which includes the unbundling of the electricity sector. The unbundling of the electricity sector has led to increased competition and efficiency in the sector, with the private sector playing a significant role in the development of new power capacity.

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**ON-GRID GENERATION CAPACITY(MW) 2018**

Figure 1: 2018 ECOWAS Generation Capacity Mix (MW)

[Diagram showing the percentage of on-grid generation capacity by country in 2018, with categories for thermal, hydro, and renewable energy capacity.]

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13 African Development Bank 2020
14 African Development Bank and APWA 2019
years, the other member states have moved in the right direction by encouraging private investment in the sector via IPPs. This signifies steady progress towards further liberalization for the region.

Sector reforms are an important part of the electricity sector’s development as they typically improve efficiency in the sector, thereby leading to higher levels of performance, on average. However, these reforms have to be carefully thought out and planned with the objective of preserving and balancing end-customer and investor interests, while achieving the government’s goal of ensuring reliable and affordable electricity for its people.

In the African Development Bank’s Electricity Regulatory Index (ERI) 2019, 35 African countries are scored based on the development of their electricity sector regulators. The positive thing the ERI highlights is that all these countries have legally established regulatory bodies, most with an energy or electricity sector law. The legislation in these countries has established the roles and objectives for the regulators in the areas of licensing, oversight, tariff regulation and conflict resolution in the sector. However, this excludes Guinea-Bissau, which does not have a regulator. Furthermore, when considering other indicators from the ERI study, it becomes clear that in terms of the three basic regulatory principles of transparency, protection of customer/stakeholder interests, and independence, many of these
countries still have a significant amount of progress to make. A key limiting factor for all countries is the lack of regulatory independence from political and utility stakeholders. While some progress is being made, there is still some way to go in this area of reform.

Apart from Ghana and Nigeria, who have unbundled utilities with Nigeria going a step further to completely privatise generation and distribution activities, the rest of the ECOWAS member countries have not restructured their electricity sectors, and still operate as state owned monopolies. Additionally, although there have been recent introduction of Independent Power Producers (IPPs) in the rest of the ECOWAS countries, the level of private participation is low, and the right to purchase and distribute power is still limited to the integrated public utilities. Only in Nigeria and Ghana, are the markets liberalized, where private entities can engage in cross-border power sale and purchasing. The underlying national market structure has implications for the level of trade in the regional market because it limits participation in the region’s cross-border trade to public utilities, inevitably constraining the demand in the market. While this might not be an immediate concern given that trade is currently via bilateral contracts between utilities, it becomes a more prominent issue as the regional market develops.

Moreover, a key concern about the lack of sector reforms are the economic and operational inefficiencies that often stem from it. The most significant issue comes in the form of non-cost reflective tariffs which negatively impact the utility’s financial performance and consequent ability to finance its capacity investments and operational needs. The result is the existing unreliable and intermittent poor-quality electricity, for which customers are reluctant to pay higher prices. Indeed, even when customers are willing to pay in order to get reliable service, it is sometimes the case that government is reluctant to increase tariffs due to electoral or political reasons.

This has created a vicious cycle of insufficient revenues and the subsequent lack of funds for the utilities to improve service, and highlights the need for independent regulators that can mandate cost-reflective tariffs. Given that the regional market is comprised of the national electricity sectors, the importance of regional-level support for market reforms and policies that contribute to the development of the member states’ electricity sectors cannot be over-emphasised.

<table>
<thead>
<tr>
<th>Country Name</th>
<th>ERI Score (Out of 1)</th>
<th>Overall ERI Rank</th>
<th>ERI Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>0.693</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Ghana</td>
<td>0.663</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Nigeria</td>
<td>0.607</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Niger</td>
<td>0.572</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Mali</td>
<td>0.570</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>0.561</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>Gambia</td>
<td>0.549</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Togo</td>
<td>0.525</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td>0.519</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>Benin</td>
<td>0.491</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>0.472</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>Liberia</td>
<td>0.267</td>
<td>34</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 3: Surveyed ECOWAS Member States in 2019 ERI Score and Rank

15 African Development Bank 2019
16 The 2019 ERI surveyed 35 different African countries
Current Trade Levels

There are three major exporters in the region: Nigeria was responsible for about 60% of the exports in 2018, followed by Côte d’Ivoire (23%) and Ghana (17%).

In Figure 4 and Table 4 below, the net importers in the region are shown. Benin imports almost all of its electricity consumption. It is a similar case in Niger and Togo. Burkina Faso and Mali are more moderate in the proportion of consumed electricity that is imported, while Senegal and Gambia have significantly smaller portions. One fundamental reason behind the imports is the presence of cheaper electricity in Nigeria, Ghana and Côte d’Ivoire, relative to the high costs of importing fuel to run the thermal generation plants. This relatively high dependence on imports for these countries is caused by their lower generation capacities and thermal-based generation plants that rely on costly fuel imports.

<table>
<thead>
<tr>
<th>Net Importers</th>
<th>The Gambia</th>
<th>Senegal</th>
<th>Mali</th>
<th>Burkina Faso</th>
<th>Togo</th>
<th>Niger</th>
<th>Benin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported Proportion of Consumption</td>
<td>1.3%</td>
<td>7.5%</td>
<td>24.0%</td>
<td>45.0%</td>
<td>71.0%</td>
<td>82.8%</td>
<td>98.5%</td>
</tr>
</tbody>
</table>

Table 4: Proportion of Electricity Imported

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17 African Development Bank 2019
18 In this table, OMV production is considered as domestic production and not importation.
Despite the high proportion of imports to these countries, the utilization of the transmission interconnectors is low at an average of 42% of capacity. Unconfirmed estimates of the 2019 regional export numbers show that 9.5% of the total energy produced in the region was exported.\textsuperscript{21} While these numbers do appear low, there are some explanations related to physical/technical barriers to trade. The first is that the projects to close the regional grid, thereby allowing electricity to be sent across the region, are still on-going. Furthermore, there are some technical limits that are present in some of the importing countries.

\begin{table}  
\centering  
\begin{tabular}{|l|c|c|c|}
\hline  
\textbf{Transmission Line} & \textbf{Capacity} & \textbf{Utilization (2017)} & \textbf{Reason} \\
\hline  
Ghana & Togo & 216 MW & 14\% \text{ CEB low payment capacity} \\
Côte d’Ivoire & Ghana & 280 MW & 17\% \text{ Both countries transitioning to surplus} \\
Côte d’Ivoire & Burkina Faso & 113 MW & 58\% \text{ PPA structure limiting exports from CI} \\
Côte d’Ivoire & Mali & 80 MW & 46\% \text{ Transmission Synchronisation Issues} \textsuperscript{20} \\
Mali & Senegal & 250 MW & 16\% \text{ Bidirectional usage; utilization is restricted to transmit each country’s share from the Manantali dam} \\
Nigeria & Niger & 80 MW & 60\% \text{ High exports from Nigeria due to Nigerian DISCO revenue issues} \\
Nigeria & Benin & 210 MW & 85\% \\
\hline  
\end{tabular}  
\caption{Cross-Border Transmission Line Utilisation Rates 2017}  
\end{table}
Barriers to Regional Electricity Trade

There are a number of reasons influencing the ability and willingness to trade electricity in the ECOWAS Regional Electricity Market. They include:

- Technical Limitations due to transmission infrastructure of receiving country
- Supply Capacity Constraints
- Lack of political will, driven by concerns about national energy security
- Bankability and credit worthiness of the utility to pay
- The prevalence of vertically integrated utilities, thereby preventing large/industrial private buyers from engaging directly in trade
- Constraints in the National-level transmission infrastructure and access to the grid
- Yet to be operationalised Transmission Pricing Methodology with the associated pricing model and the need for further empowerment of regional institutions

Each of these reasons points to different gaps in the development of the electricity sector, which in turn highlights different actions that need to be taken by regulators and policymakers in the electricity/energy sectors in these countries. Common to many of them, is the lack of cost reflective tariffs, impacted by regulators that are not fully independent and in need of capacity building, as well as the underlying market structure and the barriers inherent in an electricity monopoly and lack of private participation in power purchasing.
Discussion of Barriers to Regional Trade

The rest of the paper focuses on taking a closer look at and understanding why these barriers to trade exist.

Technical Limits due to Transfer Capabilities of the receiving country

The maximum operating capacity or the total transfer capability of the line can often be lower than the line’s thermal limit. This means that although the line is rated to transmit a capacity of 500MW, for instance, in operation, that number has an upper bound of 300MW, which is lower than the stated capacity of the line. The total transfer capability of the line is dependent on the voltages at the exporting country (source) and importing country (sink), as well as the load (components that consume power) on transmission elements, e.g. lines close to the connectors, substations, transformers etc. Due to these factors, a high capacity line will be unable to transfer power beyond those limits. This is the case for the connection between Nigeria (Ikeja West) and Benin (Sakate). The rating for the receiving substation in Benin republic, is lower than the rating for the line, and that is another limiting factor.

The interconnector between Ghana and Burkina Faso illustrates another example. In this case, the transfer capability analysis shows that it is not advisable to send power above a certain capacity, because of the transmission system in Burkina Faso. This is to avoid issues around voltage, and the lines being overloaded.

Mali’s internal transmission system is also constrained. Specifically, because Mali’s transmission is essentially divided into two, one part has access to the electricity coming from the interconnecting line with Côte d’Ivoire, but efforts to connect the other part of the transmission line have proven futile so far. Consequently, although there is a high demand for imports from Côte d’Ivoire, to replace Mali’s significantly more expensive electricity, only part of that demand is being fulfilled. To address this specific issue, and others like it, WAPP is conducting a synchronisation project. When this is complete, Nigeria will be able to send power to Ghana, for instance, which it cannot do currently because they are in different synchronous blocks.

The WAPP still has to conduct specific technical analysis on each of these individual cases, to determine the best approach to overcoming these hurdles.

In addition to these technical constraints, there are various reasons trade is at this level. The rest of the paper explores these reasons, drawing from the realities around the current major exporters: Nigeria, Ghana and Côte d’Ivoire, and major importers: Benin, Mali, Togo, and Burkina Faso.

Supply Capacity Constraint

The coastal countries - Nigeria, Ghana and Côte d’Ivoire - are the electricity exporters in the region and are able to exploit their natural gas resources to access cheap gas. Nigeria is the most endowed in this sense, having one of the largest natural gas reserves on the continent. Apart from Côte d’Ivoire, which still operates a vertically integrated utility, the early move to unbundle and open up the sector to private power producers seems to have played a role in allowing investment into generation capacity expansion in these countries. Indeed a major constraint in developing capacity is the availability of funds for expansion. Given that most public utilities are having to be financed by federal budgets, especially as their financial viability is threatened by non-cost reflective tariffs, investment for capacity expansions has not always been possible. However, private investment is often free of such financial constraints and private cooperations are often more effective at ensuring they make the returns on their investments. Private sector investment and participation in the sector is an area in which most of the other countries still struggle, even as private generation through IPPs have recently become more encouraged.

Despite emerging surpluses in some countries, there are still instances of supply deficits in other countries in the region. For example, Niger, which depends highly on electricity imports from Nigeria, has had to deal with supply issues in the past when its import demand exceeded the transmission line transfer capability in 2016. Physical infrastructure barriers such as this are being addressed by various priority infrastructure projects in the WAPP master plan.

Another significant constraint to supply of affordable electricity in the region is interruptions to gas supply. The West Africa Gas Pipeline (WAGP), built to supply Ghana, Togo and Benin with gas from Nigeria, is still operating under capacity.23 The Tony Blair Institute report states
that, gas resource availability in Nigeria, payment arrears issues in Ghana - which the Ghanaian government is now addressing and pipeline vandalism are the biggest concern. It is important that these issues are addressed as their resolution will result in considerable gains for Nigeria, Ghana, Togo and Benin.24

Political Will and Energy Security

When a country decides to import electricity, it becomes dependent on another country for a portion of its electricity supply. This situation is often perceived as a threat to national safety and energy security and should not be underemphasised.25 Even without any prevalent political tensions, the government of a country might not want to risk being stranded without electricity with little or no control over the situation. This risk aversion contributes to the weak political will and commitment to regional trade and is a major reason for prioritising domestic generation even in cases where imports are available and cheaper.

This is clearly not the case in Benin, Niger and Togo, who each imported 98.5%, 82.8%, 71% of their electricity consumption in 2018 (see Table 3). However, it does not mean that there are no perceived threats. For example, in 2014/2015 when Ghana was experiencing serious power shortages, there is anecdotal evidence of domestic dissatisfaction with having to supply neighbouring Togo and Benin with electricity when the country itself was struggling to satisfy its local demand. Without the strong legally binding contracts in place, there is a possibility that domestic political pressure might have interfered with Togo/ Benin’s electricity supply. However, apart from the need to prioritise growing domestic demand, any threat on the exporting country’s power supply introduces a threat for the country importing the electricity. These are the kinds of risks that are being avoided when countries choose to limit their reliance on imported electricity. However, while the countries try to mitigate risk, they reduce the demand for imported electricity in the market, sometimes at a higher cost to its citizens.

One way to mitigate this particular constraint, is through strong legal frameworks which gives confidence to trading partners. However, there are still questions around the enforcement of these contracts in practice. Specifically, the extent to which ERERA or ECOWAS has power to enforce these contracts - particularly for bi-lateral contracts, and the consequence of failing to honour them are not clear as yet. It is important therefore to establish a legally recognised and accepted supranational authority with the appropriate legislation to enforce these contracts. This calls for institutional readiness in the ECOWAS setting, even beyond the energy market.

Apart from the legal framework, it is important for investors and leaders of ECOWAS countries to become acutely aware of the benefits their electricity sectors stand to gain from regional trade. Information in reports such as the West Africa Power Trade Outlook clearly spell out the financial benefits for each country and is useful for decision making and increasing political will to trade. Ultimately, it is important for a country to be able to strike a balance between domestic generation and imports, balancing energy security concerns, costs and the availability of sufficient power supply.

Furthermore, it becomes possible to partly avoid this issue when market reforms allow the private importation of power. A large/industrial private purchaser, who is willing and able to pay for imported electricity, does not have to take on the whole risk of the country’s energy security. It will be able to satisfy its needs should the domestic generation not suffice, while the risks of interrupted supply remain its own. Restricting cross-border trade to state monopolies suppresses these types of demand. However, a liberalized regional market is not possible without a liberalized national market, including utility unbundling, independent regulatory institutions and cost-reflective tariffs to enable this. It further underscores the need for sector reform.

Financial Ability to Buy Imported Electricity

In Table 5, the reason given for the 14% utilisation of the Ghana – Togo/ Benin transmission line is the Benin Electricity Community (CEB)’s low payment capacity. A number of public utilities in the region are struggling financially. There are multiple reasons for this, however a fundamental culprit is the slow-going implementation of market reforms in these countries. Unfortunately, many of the government-owned and -run utilities have historically been financially mismanaged. Common issues across most of the countries include the high cost to produce and deliver electricity, the fact that end user tariffs are not cost-reflective, and the inability of the customers to pay those prices. Countries such as Niger and Benin, for example, with higher generation costs are exactly those that will most benefit from trade.27

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24 Singh, et al. 2015
25 Tony Blair InsAtute for Global Change 2019
26 CEB is the common entity for Benin and Togo and sole authorised buyer of energy from the regional market
27 Ghana is currently dealing with issues of expensive surplus electricity capacity.
This is illustrated clearly in Figure 6.  

28. African Development Bank 2019
29. Excluding Ghana, these figures are estimates of the generation cost, using different means of estimation included various weighted averages or generation expenditures.
30. The World Bank 2019

Constrained revenues make it difficult to pay for purchased power, or the power that needs to be purchased. Where a private or unbundled company might be incentivised to collect its revenues, the government often ends up subsidising its inefficiencies. For example, in Burkina Faso, where costs of fuel are high, the financial gaps are often bridged by budget transfers. 30 Many of these national utilities have to deal with theft from illegal connections, low billing and collection rates, and tariffs that are not cost reflective, all of which have had a negative impact on its revenues and affects the extent to which it is able to trade in the regional market.

Risk guarantee products from development finance institutions are a proven way to help build confidence in the short to medium term. However, in terms of building transparency around the financial realities of the
member utilities, the regulators can play a substantial role. If there are no appropriate regulatory frameworks to guide economic regulation of the sector in a country, it becomes even more difficult for the utilities to develop and maintain financial efficiency. In the 2019 ERI, one of the indicators for the Regulatory Substance Index, which measures the level of implementation of the sector regulatory frameworks, is the Economic Regulation indicator. This indicator assesses whether the country has comprehensive tariff guidelines and methodology, with the needed adjustment mechanisms, and if its regulator has the capacity to review tariffs. When a country’s electricity sector has well-developed economic regulation, it supports transparency, improves investor confidence and enables planning for long-term investments.

Economic regulation also has a role to play in supporting confidence-building at the regional level. The presence of cost-reflective tariffs, with transparent and clear methodologies, provides visibility for trading partners when engaging in the bilateral contracts that will facilitate trade.

Out of the ECOWAS countries surveyed for the index, quite a few still have significant progress to make. Burkina Faso, Togo and Côte d’Ivoire have significant room to grow in this area. The specific areas that need attention are in:

- Developing a clear and well-documented tariff-setting method
- Developing automatic tariff adjustments/indexation mechanism
- Undertaking a comprehensive study on cost of service
- Setting a network connection policy as part of the tariff guidelines
- Capacity building for staff to provide the technical expertise required to develop the economic regulatory capacities of the countries.

It is worth noting that these particular economic regulatory indicators look at the presence of the economic regulatory framework and instruments, but

ECONOMIC REGULATION INDICATORS

Figure 7: African Development Bank Economic Regulation Indicators from the 2019 ERI

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31 Guinea and Guinea-Bissau not surveyed in 2019. Guinea-Bissau does not yet have a regulator.
do not include points for their implementation. This is why Nigeria, which has these regulatory frameworks, but largely insolvent utilities, scores quite highly. It is yet to enforce cost reflective tariffs, which hampers utility efficiency and solvency. However, that only points to the need to develop and emphasise the implementation of these necessary frameworks, in order to build confidence in the market.

Addressing these regulatory issues will contribute to making the utility financially viable and efficient. It is key to enhancing regional trade. When these regulatory frameworks are properly implemented, the issue of solvency reduces. The result is larger confidence in the market and the ability of its participants to pay for what they have bought. This is a major area in which the regional regulator can play a significant role. In the South African Power Pool, for instance, Botswana has a nascent regulator that is successfully benefitting from the guidance of the regional regulator in its development, and the maintenance of its independence. Since ERERA has a region-level mandate from ECOWAS, it has the power to do the same in these member countries.

**Constraints on Large/Industrial Private Demand**

While a few of the state utilities might struggle to buy cross-border electricity, there might be private institutions, such as industrial users, that can afford to. These institutions might have a need to import power if the cost of buying it from another country is cheaper than importing fuel to run their own generators. For example, an IPP in Nigeria, which has access to cheap gas might be able to provide cheaper electricity supply to a large factory or mine in Niger, who wants to avoid the high costs of imported fuel. However, the demand becomes constrained if the only parties allowed to import electricity into the country, are the publicly owned utilities. In this case the willingness and ability to pay are clear, but the legal ability to buy the electricity is missing. The mine might have to use its own generator when it can be importing energy more cheaply because of the structure of its country’s electricity market, and the fact that it is not liberalized enough to allow individual participation in cross-border trade. This further points to the need for more support for market reforms, in order to allow private access to the benefits of regional electricity trade. This has implications for the regional market in terms of who is allowed to trade. While the current market operates under bilateral contracts the presence of these vertically integrated utilities might not be too disruptive of the regional market. However, as the market develops, and hopefully evolves to a spot market, the current barriers to private entry will become more significant.

**Open Access**

Linked to the constraints on private demand is the question of open access. Open access implies that the country’s transmission infrastructure can be used by any entity to facilitate the transportation of traded energy across borders. In this case, the entity that will provide regulatory oversight for transmission, ERERA, will be fair, avoid conflict of interest, and have clear rules managed by an independent transmission operator where there are no vested interests i.e. WAPP. Open access is important for ensuring success of the regional market because it promotes efficiency of the market. With access restricted, owners of the grid may refuse access to other generators, thereby disrupting the free flow of electricity, and restricting access to the regional market.

Not all countries have open access to the regional transmission network. In particular, Côte d’Ivoire, Gambia, Guinea, Guinea Bissau and Senegal still have restricted access32. In reality, an additional requirement for open access to be effective is the presence of an independent entity managing the transmission network at the national level. This is the case only in Nigeria and Ghana, the rest still being vertically integrated. So, it raises questions about how the principles of open access are being applied in the other countries. Apart from Côte d’Ivoire, the countries that have not adopted the open access directives set by ERERA do not yet have significant levels of activity in importing or exporting electricity. But as the interconnections are built and the transmission loop is closed, the issue of restricted access begins to have an effect. Therefore, the need for reform will become more evident in these cases.

**National/Internal Transmission Infrastructure**

On a related note is the state of the transmission infrastructure in the country. There might be an industrial customer in Burkina Faso that wants to import electricity from Côte d’Ivoire, assuming that this private individual is able to buy electricity, and Côte d’Ivoire has adopted open access for its transmission network, there is still the question of whether or not the transmission network in Burkina Faso is robust enough to deliver electricity to this customer. Indeed, this is the situation being faced in Mali, as mentioned earlier in this paper. The state of the local infrastructure also plays a role, along with the question of open access.

While cross-border infrastructure projects are on-going, it is important that the national networks that will deliver power to the final customers are not ignored. This is still a current issue in most countries, whose public utilities
have historically been unable to afford the maintenance and/or expansion of existing infrastructure required for sector evolvement.

**Transmission Pricing Methodology**

Regional institutions - WAPP and ERERA have developed an ECOWAS Regional Transmission Tariff Methodology. However, it is not yet fully implemented for electricity trade within the region. Although it has been drafted and currently under review for validation, a pricing model derived from this tariff methodology remains missing. The current practice for transmission pricing is that, different countries use different methodologies for calculating transmission tariffs, which cumulatively ends up making end-user tariff for imported power, quite expensive. The relatively high cost of imported power distorts prices and acts as a further barrier to trade, because ideally, imported electricity should provide cost savings to the buyer. Operationalising the Regional Transmission Pricing Methodology will help address this distortion; and empowerment of the regional regulator to enforce the pricing methodologies for regional trade deepens the market.

**Other Considerations Around Trade**

On the regulatory landscape, the level of regulatory development across the region is varied, with some being more developed than others. However, of significance to the regional market is the development of technical regulatory instruments in the form of grid codes, market rules and most importantly, transmission tariff methodology. The grid code regulates how new power generating plants connect to the electricity grid. Market rules ensure fair and proper participation in the electricity market, while transmission tariff methodology helps clarify how to apportion transmission costs including treatment of losses as the electricity is transmitted across-borders from one country to another. It becomes especially important for these technical regulatory instruments to be harmonized across the region, to facilitate, as much as possible, easier transportation of the traded electricity. Otherwise, if Nigeria, for instance wanted to sell electricity to Liberia, having to go through Benin, Togo, Ghana and Côte d’Ivoire, without the grid code, it may be physically/technically problematic to do so, even if there are transmission interconnectors to make it possible, because of the differing technical standards. Additionally, it needs to be clear how to define the tariffs – which losses will be borne by which parties? This is where a regional grid code and a fair and clear transmission tariff methodology become important. The WAPP is currently in the process of developing the regional grid code.

Apart from the regional grid code, electricity market rules and procedures are regulatory instruments used to govern electricity markets, making sure that they are efficient, competitive, transparent and reliable for electricity trade. The WAPP has published Regional Market Rules, Regional Market Procedure, Regional Market Admission Form and Regional Market Participation Agreement, and is in the process of registering new and existing WAPP members as market participants. As mentioned earlier in this piece, it has a formal registration process, which, as the market develops, will likely become mandatory for regional market participation. This is separate from the current membership of WAPP, which is more of an association than a formal market register.

These instruments take the development of the regional market a step further and are part of the process of WAPP evolving into a regional system operator. They facilitate regional trade by creating a platform that will provide regional-level visibility to national operators as they deliver the electricity that is being traded across borders.
Conclusion

The current levels of activity in the ECOWAS regional market appear to be low, with only around 9.5% of total produced energy being traded in 2019. However, there are a combination of technical and non-technical issues that constrain the supply or demand of electricity in the regional market. Many of these constraints can be addressed through market reforms, especially in countries that still operate state-run monopolies. A renewed focus and emphasis on market liberalisation at the national level and open access in all countries will free up capacity and demand at the regional level. This will allow the flow of trade and increase abilities to satisfy the current on-grid demand, including suppressed demand.

The regional bodies – WAPP and ERERA – have a significant role to play in supporting member countries in developing these specific aspects of their sectors, especially as it relates with regulatory development and capacity building for the sector. Although, WAPP and ERERA themselves are engaging in capacity building projects, they can still begin to increase their support of member states where possible. ECOWAS also has a role to play in further promoting the political will to trade, and securing political buy-in where it matters, especially in committing to allowing the independence of regulatory bodies.

While the constraints mentioned in this paper are important to address, there are many other infrastructure, operational, institutional and governance issues that also need attention. That being said, the steady progress WAPP is making will be safeguarded if these issues are resolved with policy makers in the member countries.
**Acronyms and Abbreviations**

- **CEB**: Benin Electricity Community
- **DisCos**: Distribution Companies
- **ECOWAS**: Economic Community of West African States
- **EPPs**: Emergency Power Producers
- **EREM**: ECOWAS Regional Electricity Market
- **ERERA**: ECOWAS Regional Electricity Regulation Authority
- **ERI**: Electricity Regulatory Index
- **IPPs**: Independent Power Producers
- **NDEA**: New Deal on Energy for Africa
- **PPA**: Power Purchase Agreement
- **WAPP**: West African Power Pool

**Works Cited**


