



# Are West Africa's policy, planning, and regulatory frameworks missing the harmonization piece of the power pooling-renewable energy puzzle?

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## ABSTRACT

Sound policy, planning and quality regulation are cornerstones to co-creating national markets conducive to the implementation of an efficient regional electricity market. This study examines the policy, planning and regulatory substance and processes in the West African Power Pool, focusing on four countries, namely Burkina Faso, Côte d'Ivoire, Ghana, and Mali. Through its specialized institutions, the region seeks to leverage shared resources and complementarities to scale up sustainable electricity generation and enhance cross-border electricity trade. The study, however, reveals half-hearted renewable energy (RE) policies, weak RE investment planning and inconsistent regulation on the one hand, and on the other hand, a lack of harmonization of regulatory frameworks which are often misaligned with the regional vision. This translates into missed opportunities to attract the necessary investments in sustainable power infrastructure, particularly from the private sector, and to mutually develop a regional market capable of tackling the long-standing challenge of access to reliable and affordable electricity amid the climate crisis. This can be reversed if countries are fully committed and duly equipped to improve their policies and planning processes, and adjust and harmonize their regulatory frameworks under the guidance, support, and leadership of the regional entities.

## 1. Introduction

In the Economic Community of West African States (ECOWAS), regional collaboration in the power sector has a relatively long history of bilateral imports/exports between neighboring countries with contrasting generation levels, mixes, costs, and demand. The West African Power Pool (WAPP) was established in 2006 to create economies of scale in countries with relatively small power systems to integrate them into a competitive environment to reduce generation costs and ensure affordable end-user prices, open to all market agents (WAPP, 2019).<sup>1</sup> To regulate open and transparent cross-border trade and assist members in the preparation of bilateral contracts, the ECOWAS Regional Electricity

Regulatory Authority (ERERA), established in 2008, operates in close partnership with national regulatory bodies to ensure a harmonized implementation of the regional energy policy (ECOWAS, 2016). For the 14 countries that have their power utilities members of the WAPP, power infrastructure remains a crucial weakness of the electricity sectors, mainly stemming from a lack of financing and poor planning processes (Avila et al., 2017; Bissiri et al., 2020; Ouedraogo, 2017; WAPP, 2020). As reiterated in a recent report of the African Development Bank (2023), the sustainability of power infrastructure is equally a significant impediment to unlocking the potential of endogenous resources for accelerating economic growth and development amid the triple climate-finance-security crisis.

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<sup>1</sup> All 14 mainland ECOWAS States have their power utilities members of the WAPP. At the time of writing this paper, the sudden political decision by three countries (on January 28th, 2024), namely Burkina Faso, Mali, and Niger, of immediately withdrawing from ECOWAS was not made public (Wong, 2024). Negotiations are ongoing between ECOWAS and the three countries, and it remains unclear how and how fast this decision will affect the countries' participation in the WAPP. However, this topic goes beyond the scope of the present study.

West Africa hosts four countries of the global top ten most vulnerable countries to climate change (African Development Bank, 2023). There is region-wide awareness of the pivotal role of utility-scale and off-grid RE through the adoption of the ECOWAS Regional Energy Policy and the creation in 2010 of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). ECREEE works with a national focus entity in each member country and promotes the development of RE, energy efficiency (EE), and national capacity-building in terms of human resources (ECREEE, 2013). In the face of long-standing financial constraints to raise the necessary investment capital for sustainable and universal access to electricity, recent trends indicate that the region will attract more local and international private investors for infrastructure development. Individual countries are increasingly seeking Public-Private Partnerships (PPPs) in power infrastructure and have expressed the need for greater involvement of the private sector to help relieve indebted state-owned utilities (ECREEE, 2013; Tractebel Engineering, 2018). In line with their Nationally Determined Contributions (NDCs) following the Paris Agreement, countries have individually committed to scaling up their RE shares. Yet, the pace remains slow and weak compared to countries in South-East Asia and the developed world which paradoxically enjoy lower RE endowment. The region is, thus, largely missing the opportunity to leverage its widespread RE endowment and its supply-demand complementarities in the power pool. In addition, recent unforeseen events such as the Covid-19 pandemic and the Russia-Ukraine war with ripple effects on energy commodities prices in West African countries (African Development Bank, 2023) have further unraveled the weaknesses and deep interconnections of the region's energy systems. This emphasizes the necessity to urgently devise collective solutions, particularly addressing the supply chain discrepancies and the financing gaps by diversifying resource mobilization through increased private sector participation and building strong regional integration.

Inherent to the financing hurdles of power infrastructure development is the challenge for the policy and regulatory frameworks to harmonize the organization, rules, and regulations for mutual benefits. Global case studies reveal that coordination and harmonization between national and regional counterparts are key to capturing the economic, social and environmental benefits of regional cooperation. While coordination stands as a prerequisite, harmonization is often the next step after coordination is established for regional power integration (ESMAP, 2010). Harmonization consists of a set of common technical, economic and legal norms and rules put in place for the good functioning of the interconnected systems. Since it provides a sound framework for minimizing investment risks by increasing certainty levels on revenue flows, access to the transmission network and regulation, coordinating and harmonizing these rules specifically plays a pivotal role, especially when accrued private sector investment is actively sought (ESMAP, 2010; Figueiredo et al., 2015). For the WAPP which has embarked on the power pooling and RE boat with countries operating different yet similar policy processes and practices with diverse energy endowments, this challenge appears as a leapfrogging opportunity with the support of specialized regional institutions.

Focusing on a subset of four interconnected West African countries, namely Burkina Faso, Côte d'Ivoire, Ghana and Mali, the present study provides answers to the following questions: *What are the national policy provisions and practices guiding power infrastructure, specifically RE portfolio development? What are the substance and processes of national regulation shaping (private sector) investment in RE-based power supply? Where are the policy and regulation weaknesses and misalignments and the possible rearrangements for higher quality outcomes?* The main contributions of this study are two-fold, learning from the gaps unraveled by literature mapping using the Litmaps tool (Litmaps, 2023). On the one hand, it broadens scholarly research on the policy, planning, and regulatory dimensions of utility-scale RE and regional integration in West Africa. On the other hand, by focusing on countries that are representative of most remaining WAPP (and sub-Saharan African) countries – in terms of

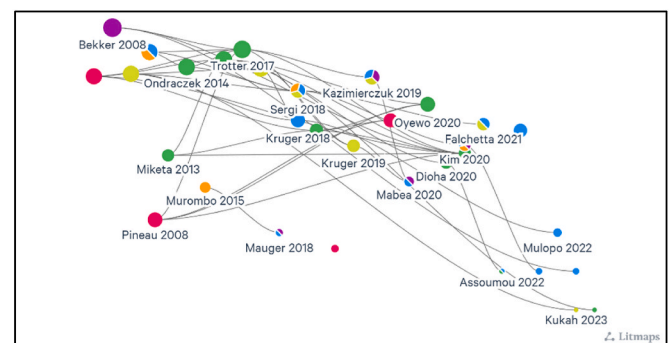
power sector structures, features and challenges, and energy resource endowment –, the gaps identified and proposals formulated may serve as guiding threads to calibrate policy, planning, and regulation to the energy transition era across the continent. Hence, the findings are significant because they culminate into implementable proposals for national policy-makers, planners, and regulators to develop collective and bold solutions to tackle the age-old problem of electricity access in the region.

The remainder of the paper is organized as follows: Section 2 reviews the most relevant literature. Section 3 lays out the methodology. Section 4 describes the study results, culminating in proposals for improved and better harmonized frameworks in Section 5. Section 6 concludes.

## 2. Literature review

The current state and future development of the physical infrastructure of power systems and regional power trade are influenced by the organizational structures that shape the provisions of (renewable) energy governance, policy, planning, and regulation. All these elements are encapsulated in the term 'power system structures'. On the one hand, power systems are embedded in a wider, multi-layer system in which all elements interact. In (IRENA, 2020), such system-wide interactions are represented using concentric circles with power systems at their core, and moving outwardly to energy systems, the economy, the society, and the Earth. On the other hand, power systems consist of the physical infrastructure and the power market structure involving a range of economic actors constantly interacting along the power sector chain, from electricity generation, and T&D, to retailing and trading. These structures have long been developed in a fossil fuel-dominated generation mix. Recent developments in the sector such as intermittent RE sources, EE and demand-side management are only starting to be accounted for, thus posing coordination and operational challenges even in the most advanced power pools in international jurisdictions (IRENA, 2020). With the expected higher integration of intermittent RE in West Africa, it appears crucial to duly adapt the design of the power systems structures at national and regional levels.

The literature review was performed through mapping using the Litmaps tool (Litmaps, 2023) which allowed identifying the different strands of research in the fields of energy policy, planning and regulation in Africa, with a focus on West Africa and RE. They are organized into six main categories (as presented in Fig. 1), namely power sector policy (Bekker et al., 2008; Kazimierczuk, 2019; Kim, 2020; Mabea, 2020; Mauger and Barnard, 2018), RE planning (Adeoye and Spataru, 2018; Assoumou and Mclsaac, 2022; Ayuketah et al., 2023; Bissiri et al., 2020; Dioha and Kumar, 2020; Miketa and Merven, 2013; Ondraczek,



### Legend

- Power sector policy
- RE planning
- RE development
- Energy and RE regulation
- Private sector participation
- Regional power integration

Fig. 1. Literature mapping of power sector policy and regulation in Africa.

2013a; Ouedraogo, 2017; Oyewo et al., 2020; Trotter et al., 2017), RE development (including investment and support mechanisms) (Abbas et al., 2022; Assoumou and McIsaac, 2022; Falchetta et al., 2021; Kazimierczuk, 2019; Kim, 2020; Kruger and Eberhard, 2018; Mabea, 2020; Mauger and Barnard, 2018; Mirzania et al., 2023; Mulopo and Mulopo, 2022; Ondraczek, 2013b; Rashed et al., 2022; Sergi et al., 2018), energy and RE regulation (Kim, 2020; Murombo, 2015; Ondraczek, 2013b; Sergi et al., 2018), private sector participation (Eberhard et al., 2016; Eberhard and Gratwick, 2011; Falchetta et al., 2021; Kazimierczuk, 2019; Kruger et al., 2019; Kukah et al., 2023), and regional power integration (Adebayo and Adeniji, 2018; Akinyemi et al., 2019; Gnansounou et al., 2007; Pineau, 2008).

It emerges that power sector regulation for utility-scale RE has attracted far less scholarly interest than planning/modeling and policy analysis, especially in West Africa. Additionally, while regional integration in power systems has been studied as early as eight years after the WAPP was established, scholars have merely highlighted the potential role of RE in addressing electricity access deficits, with no specific regard for the necessary policy and regulatory arrangements in participating countries. Across the existing research, challenges to RE development and private sector participation point towards the inconsistency of policy (compared to stated ambitions through regional and global commitments), politically vested interests in the processes and practices of power infrastructure development which do not always abide by the existing legislation/regulation, poor transparency and predictability of regulation, poor business/macro-economic climate, lack of technical capacity to implement the implications of power sector reforms, and dependency on Official Development Assistance funding (which is receding in the current context of shrinking global financial space and higher global risk aversion (African Development Bank, 2023)).

### 3. Methodology

The approach to analyzing energy policies, as well as planning and regulation as policy implementing tools, was conceptualized around a three-step assessment framework, considering three key enabling factors (Fig. 2). Such an approach was inspired by cutting-edge studies from three fields: water trade (Wheeler et al., 2017), agricultural technology (Vik et al., 2021), and electricity distribution (Srivastava et al., 2019). Additionally, the assessment framework accounts for the recent outputs from the literature on policy design which highlight the need to consider

both substance and processes in policy analysis (Bali et al., 2021; Kuenzler and Stauffer, 2023).

Step 1 allowed contextualizing the backgrounds of national power sector policies and their implementing tools i.e., planning and regulation, focusing on RE infrastructure development. Private sector participation was also characterized in each country.

In Step 2, a content analysis of the reviewed documentation on policy, planning, and regulation was performed. Consequently, in addition to national policy documents, the study used a wide array of sources, namely government repositories and press releases, official documentation of national regulatory authorities, and reports from global institutions including the World Bank, the African Development Bank, and the International Renewable Energy Agency. To remain within the scope of this study, national frameworks on the power sectors and RE development were reviewed to extract their essence and influence on utility-scale RE and cross-border trade. Hence, it was deemed relevant to structure the assessment around three key enablers of RE development and regional power trade.

The substance and processes of power sector policies and their implementing tools (planning and regulation) influencing the key enabling factors of RE development and integration in regional power trade were, therefore, examined (see Appendix). In other words, the content of policy, planning, and regulatory frameworks were analyzed following these key enablers to determine whether policies and their implementing tools are conducive to harnessing the full potential of RE sources and unlocking regional power trade as envisioned by ECOWAS and its specialized institutions (WAPP, ECREEE, ERERA). Hence, the harmonization dimension between countries and with the regional vision was considered.

The background analysis, together with the outputs of the literature mapping, guided the selection of the three key enablers. These are: (1) RE portfolio development; (2) Flexibility of existing (and planned) generation and; (3) Availability of (cross-border) transmission capacity. It is worth noting that flexibility sources go beyond the operational flexibility of the existing generation fleet and the existence of sufficient cross-border transmission capacity as addressed in this research. Other sources of flexibility include energy storage (particularly with hydro-power plants as virtual storage facilities) and demand-side management. In most WAPP member countries, self-generation has legislative backing, yet detailed information is barely publicly available. As such, flexibility sources were herein restricted to the generation level.

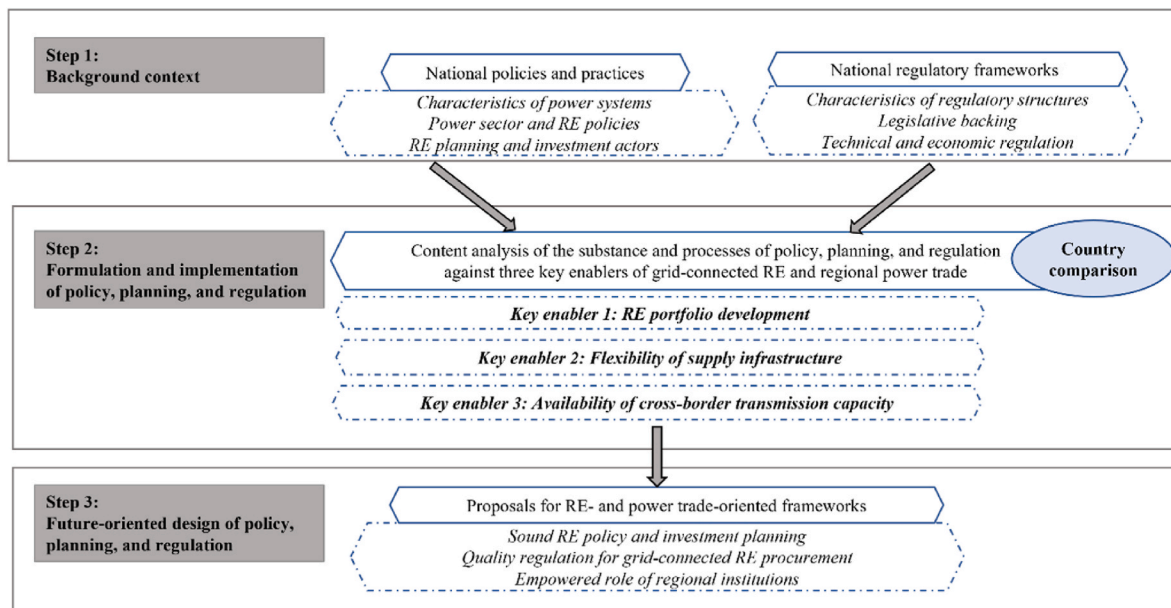


Fig. 2. Conceptual framework of the assessment of national policies and their implementing tools.

Regarding Key Enabler 1, it was particularly relevant to examine how power system structures address private sector participation in RE investment and development amid the long-standing financial constraints of national governments and state-owned utilities. The assessment also seeks to demonstrate whether these frameworks are calibrated to send proper economic and regulatory signals for higher investment in adequate generation (Key Enabler 2) and cross-border transmission infrastructure (Key Enabler 3). Therefore, the strengths and weaknesses of national provisions and processes in terms of policy, planning, and regulatory frameworks of the power sector were identified.

The outcomes of Step 1 and Step 2 ultimately served as guiding threads for a three-pronged proposal (Step 3) for transforming the current power pooling and trade dominated by conventional power systems and business-as-usual approaches, to more RE-responsive structures ensuring system reliability, increased private sector participation, and a competitive regional market.

#### 4. Results

##### 4.1. Background to electricity policy and regulation in West Africa

In West Africa, power systems have traditionally been developed and operated under State monopoly, with generally poor service delivery quality even in countries boasting relatively high electrification rates (Avila et al., 2017; World Bank, 2023). As a result, countries have, with varying success levels, implemented various reform programs aimed at improving the power sector, with the support of donor organizations (ECREEE, 2013; Quitzow et al., 2016; REN21, 2014). They fall into three categories, namely privatization (full or partial), liberalization (full or partial), and regulation. In most cases, liberalization has occurred partially by opening the generation segment to Independent Power Producers (IPPs). These are specific forms of PPPs emerging for infrastructure development to tackle the lack of financial resources faced by governments and boost investors' confidence in the sector.

The four countries under study share cross-border interconnections, and similarities and differences in the general landscape of their electricity sectors. In terms of power infrastructure characteristics, Burkina Faso and Mali share similarities and stand in contrast with Côte d'Ivoire and Ghana which are also similar. The former group boasts the most endowment of solar photovoltaics (PV) and wind power potential yet diesel-fueled power plants hold the lion's share of the electricity supply (70% in Burkina Faso and 69% in Mali, in 2020) (AfDB, 2023; MEMC, 2022; UNDP, ECREEE, 2023). Côte d'Ivoire and Ghana's power systems are dominated by natural gas-fueled power plants (82% and 69% of national generation mixes, respectively in 2020) (AfDB, 2023; AFREC, 2023; Energy Commission, 2022), followed by hydropower. Furthermore, policy and regulatory frameworks highlight different commitment levels to utility-scale RE consistent with the actual levels of deployment. Burkina Faso has rapidly emerged as a growing leader in PV deployment and attracting local and international IPPs. As well, Ghana is also more effectively reducing the country's reliance on

climate-dependent hydropower, achieving IPP electricity rates that are consistent with market rates, and betting on PV-hydro complementarities.

While private sector investment in the energy sector i.e., the generation, transmission, and distribution segments of electricity and natural gas vary between countries, recent trends show significant increases (see Fig. 3). In Burkina Faso, it rose by 46% between 2017 and 2020 and by 69% between 2020 and 2021. In Côte d'Ivoire, a growth of almost 40-fold was recorded between 2010 and 2019, rising nearly 4-fold in 2020 followed by a 71% decrease in 2021. In 2019, private sector investment in Ghana was over 7-fold that of Côte d'Ivoire. As for Mali, it has witnessed the weakest and least dynamic private sector investment trend, with a 6% decrease in 2020 compared to 2017 levels and a further decrease of almost 60% in 2021, at a level amounting to half that of Burkina Faso (World Bank, 2023). Considering the financial constraints of public utilities with poor/no investment-grade rating, the private sector will increasingly co-exist with public funding, with IPPs through long-term Power Purchase Agreements (PPAs).

Furthermore, the four countries display differences in the configuration of their power sectors, which can be categorized into two main groups. Ghana is the only country with a full vertically unbundled electricity sector including horizontal unbundling with the participation of private operators in the generation and distribution segments. The other countries display unbundling only in the generation segments, resulting from reforms aimed at (progressively) liberalizing the sector. As such, the governance and regulatory arrangements influencing these structures are country-specific. The Electricity Regulation Index (ERI) developed by the African Development Bank and widely adopted by national electricity regulators and utilities, highlights that Ghana is the best performer (against international best practices) in the region and among the top 4 out of 43 African countries (Uganda has been the best performer three years in a row) (Fig. 4).

Additionally, performances against the three regulatory pillars i.e., governance, substance (action/decision-making based on the mandate), and outcome (impact on utilities and electricity sector) are compared in Fig. 5. Regulation governance appears to be the strongest pillar for all countries despite lower performance in 2022 compared to 2019 (except for Côte d'Ivoire). The weakest pillar is the regulation outcome, thus highlighting that even when regulatory actions may be in place (e.g., the existence of a RE law), they do not always translate into equally positive impacts on the sector if not sound and effectively/efficiently implemented.

##### 4.2. Key enabler 1: Renewable energy portfolio development

Table 1 maps the key features of energy and RE policies in the case study countries. Most have developed policies with ambitious RE targets to fuel socio-economic growth while meeting their Paris Agreement commitments. These ambitions, however, are generally not effectively implemented through sound planning and consistent regulation. It also appears that the National Renewable Energy Action Plans (NREAPs/

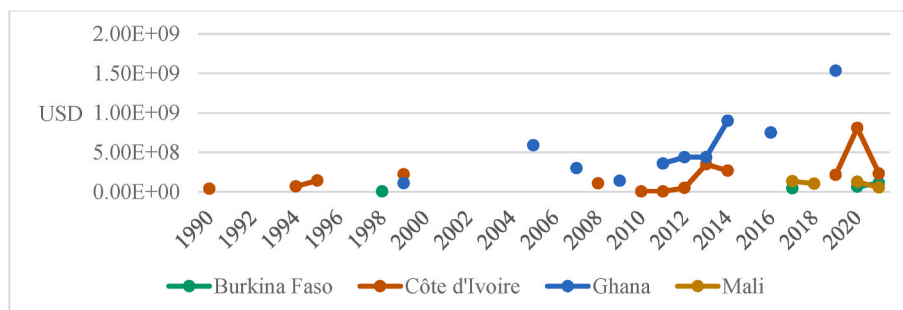


Fig. 3. Investment (in US \$) in energy projects with private participation in Burkina Faso, Côte d'Ivoire, Ghana, and Mali.



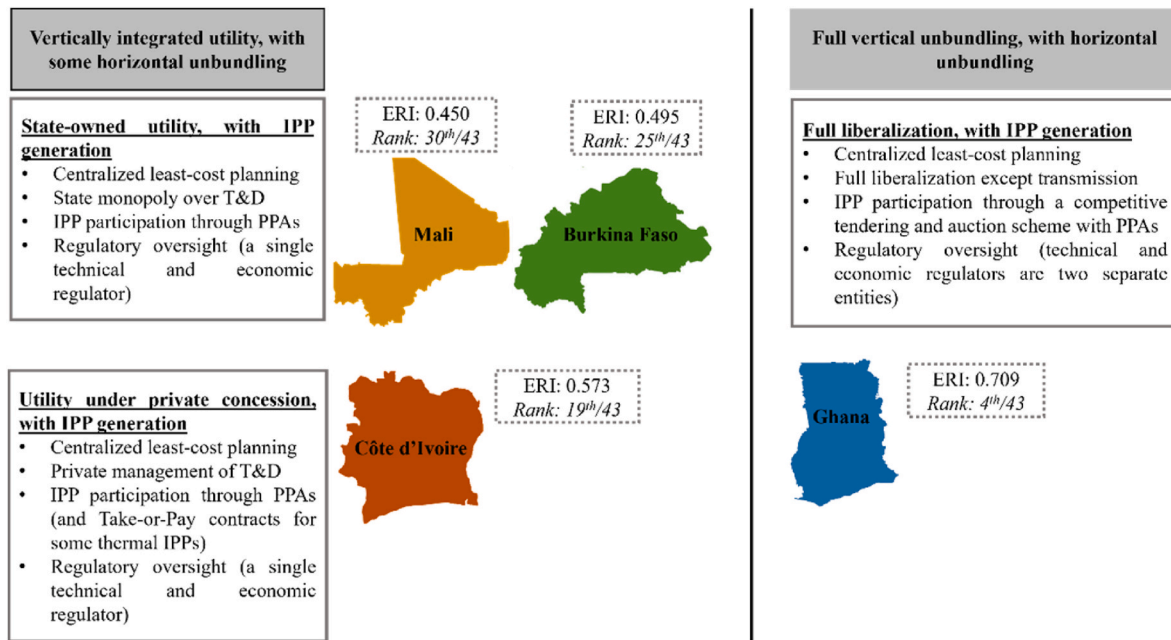
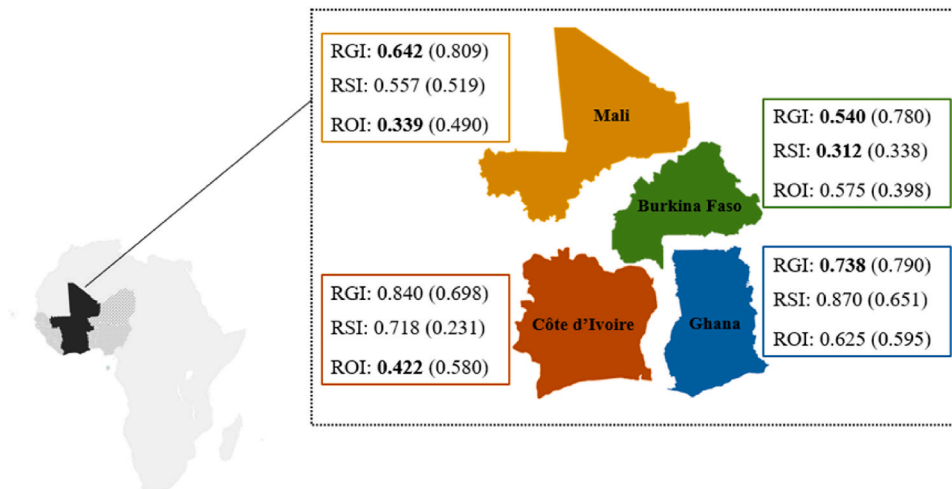


Fig. 4. Grouping of power sector configuration and country regulatory performances in 2022.



Values in bold signal lower performance in 2022 compared to 2019 levels

RGI: Regulatory Governance Index

RSI: Regulatory Substance Index

ROI: Regulatory Outcome Index

■ Study countries    ▨ Other WAPP countries


Fig. 5. Country performance on the three ERI pillars in 2019 (between brackets) and 2022, using data from (AfDB, 2022, 2019).

PANER in French) (2015–2020/2030) within the framework of the ECOWAS RE policy are not enshrined in the wider national energy and economy-wide policies. Most plans are indicative with poor operationalization levels due to weak linkages to capacity allocation between the public and private sectors, and timely and transparent procurement processes. As a result, resource mobilization has not kept pace with both national and regional ambitions, and the much-needed financing opportunities from the private sector seem to remain far-flung.

Furthermore, besides setting a conservative limit to the contribution of utility-scale RE, the 2019–2033 WAPP Master Plan for Generation and Transmission maintains business-as-usual country roles in scaling up grid-connected RE. Indeed, despite boasting a high endowment of RE sources, countries such as Burkina Faso and Mali have historically been net power importers and are envisioned to remain so even under a high RE scenario (Tractebel-Engie, 2018).

The substance of planning for RE portfolio development is provided

**Table 1**  
Mapping of energy sector and RE subsector policies in the case study countries (AfDB, IFC, 2019).

<p>The 2006 energy policy aimed to increase RE share in the electricity generation mix by &lt;1% in 2004 to 10% in 2015. It was updated in 2013 with 14 priorities including RE promotion. The National Strategy for RE development adopted in 2006 aims to increase non-hydro RE share in the energy mix to 15% in 2020 (from &lt;1% in 2002).</p>		<p>In the 2014-2025 National Energy Policy, the RE subsector is the first of the four Strategic Pillars. In its NDCs document, scaling up solar PV is expected to reduce by 14% Greenhouse Gas (GHG) emissions from the power sector by 2030, from the under 5% current share. Including small hydro and biomass, the RE policy target for the energy mix is 50% by 2025 with a particular interest in regional collaboration.</p>
<p>The development of the National Energy Policy was expected to start in 2016 according to the NREAP but it seems to be unavailable. According to the Africa Energy Portal (AfDB and IFC, 2019), the country adopted a revised version of its energy policy in 2013 (which could not be found on any government website) to become the main regional energy hub. Hence, no specific RE policy targets can be stated other</p>		<p>The National Energy Policy (2010) sets an “Energy Economy” vision with the provision of high-quality energy services to meet the socio-economic development challenges. The RE subsector is part of the vision, by providing fiscal and price-driven incentives with a Local Content Policy. In the document, there is no target for grid-connected RE. However, in its NDCs, the target is 10% of RE by 2030, against 0.55% in 2021. The energy policy highlights the</p>
<p>than those set in the NREAP as mentioned below.</p>	<p>political willingness to support regional energy integration.</p>	

in NREAPs and National Master Plans for Generation and T&D. Regulatory arrangements are backed by legislation, and are relatively distinct across countries. In Burkina Faso, by Law N°014 of 2017 on the general regulations of the energy sector, the generation segment is open to (RE) IPPs. RE development is subject to public health and environmental norms, as well as the competition rules required by the national economy (Law N°014, Art.60). No specific bidding and procurement processes are stipulated for new RE generation capacity. However, as a specific form of PPPs, RE IPPs are governed by Law N°032 of 2021 and its implementing Decree N°1337, which include local content requirements. RE generation and RE equipment imports shall be supported by tax and customs incentives (Law N°014, Art. 57). In the Master Plan for Generation, T&D and rural electrification 2017–2025, new PV additions have investment timelines and are expected to be through IPPs

only. The PANER, 2015–2030 aims to increase RE capacity to 27% from 21% in 2010. It specifies how new generation capacity and investment will be split between the private and public sectors.

In Côte d'Ivoire, Law N°583 of 1985 unbundled the generation segment, open to (RE) IPPs. The provisions of Decree N°358 of 2018 on PPPs are applicable to RE IPPs, however, no specific bidding and procurement processes are stipulated for new RE generation capacity. Ordinance No. 2018-646 of 2018 on the Investment Code (amended in 2019) provides for tax incentives under the “Green investments” category with no mention of the RE sector. By Art. 359 of the General Tax Code, Value-added Tax (VAT) on RE equipment is reduced by half to 9%. There is a customs duty exemption on solar panels, but batteries and inverters are levied by 20% (GGGI, 2021). The PANER finalized in April 2016 considers the RE targets set in the Master Plan for Generation and

Transmission, 2014–2030 (finalized in June 2015). The Master Plan states policy-imposed minimal shares for RE installed capacity (PV, biomass, wind, or micro-hydro) by 2030 set at 20% (42% for electricity generation). New investments are quantified but no criteria for allocating new capacity to the public and the private sectors are provided.

Ghana's electricity sector is fully unbundled and thus open to (RE) IPPs. Act 1039 of 2020 makes provisions for PPP projects which are applicable to RE IPPs. By the 2020 Renewable Energy Amendment Act (Act 1045), the Feed-in-Tariff (FIT) scheme was replaced with a competitive procurement scheme to attract competitive market rates for RE-generated electricity. The targeted volumes to be procured are defined in coherence with annual electricity supply and demand plans by the Energy Commission in consultation with the economic regulator. Ghana's Strategic National Energy Plan (SNEP, 2020–2030) recalls a 10% policy target for RE in the national energy supply mix (except for >100 MW hydropower) which does not exist in the 2010 National Energy Policy document. The Renewable Energy Master Plan (REMP, 2019–2030) was expected to be mainstreamed in the Ghana Infrastructure Plan (GIP, 2018–2047) yet, the planned RE investment is not consistent between the two documents. It is also unclear how the NREAP is mainstreamed in the REMP. The REMP seeks to prioritize local manufacturing in procurement processes, in line with existing regulations, notwithstanding it sets out no criteria for allocating new RE capacity between the public and private sectors. The 2023–2040 Integrated Power System Master Plan (IPSMP) is the sub-sector's strategic document stemming from the SNEP, hence the main planning document for the Ministry. It considers the REMP targets in the formulation of the least-regrets strategy. Furthermore, the GIP developed its own electricity generation capacity planning model and included concentrated solar power which was completely discarded by the IPSMP considering the characteristics of solar irradiation in Ghana.

In Mali, Ordinance N°019 of 2000 fully liberalized and opened the generation segment to national and foreign concessionaires but no specific provisions were made for RE generators. Hence, the conditions for the granting of licenses are subject to the provisions of the Ordinance and its implementing decree (Decree N°184 of 2000). By Art.8 of the Ordinance, non-hydro generation (including solar and wind energy) is considered as thermal generation. No specific procurement provisions exist for RE generation, yet new RE builds on PPP modality are subject to Law N°061 of 2016. Its implementing decree N°057 of 2017 states that private partners must be selected on an open and competitive basis based on the least-cost bid. By Art. 9, a pre-eligible PPP project must hold economic and social benefits, and a positive environmental footprint. Among other criteria is the level of local content (unquantified) by sourcing small and medium enterprises as well as artisans is a requirement (Art. 19 (3)). The PANER targets 8.6% of non-hydro in the generation mix by 2030 (3.1% in 2010), and 36.9% including hydro (65.1% in 2010). The lower hydro share by 2030 is due to the expected lower available capacity. Thus, medium to long-term demand will be met through imports from Côte d'Ivoire, Burkina Faso, Ghana, and Guinea. No criteria are provided for allocating new RE builds between the public and private sectors. In the PANER, future PV plants are planned through PPPs with sliding timelines for some IPPs (between 2 and 12 time intervals), however, all plants expected by 2020 are yet to be commissioned.

The processes for RE portfolio development are described in Table 2 from a planning perspective and Table 3 from a regulation perspective.

#### 4.3. Key enabler 2: Flexibility of generation infrastructure

None of the countries explicitly states their intentions to focus on the flexibility dimension of their generation infrastructure development for accommodating increasing RE shares (Table 4).

Natural gas-rich countries such as Côte d'Ivoire and Ghana witness increasingly strong policies for reinforcing their gas supply either from domestic shores or through the West African Gas Pipeline (originating in

**Table 2**  
Processes of planning for RE portfolio development.

	Planning for RE portfolio development
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•The Ministry of Energy is legally mandated to develop and implement the energy policy, with 5-year periodic updates. The Ministry of Energy and ECREEE oversee the 5-yearly implementation of the PANER with the Technical and Financial Partners.</li> <li>•The National Renewable Energy and Energy Efficiency Agency was instituted by Art. 12 of Law N°014, and effectively established by decree in 2019. It is mandated to promote, coordinate, and implement any activity aiming to develop RE and energy efficiency.</li> </ul>
<b>Côte d'Ivoire</b>	<ul style="list-style-type: none"> <li>•The Directorate General for Energy acted as the focal point for the preparation of the PANER, with stakeholder consultations across various ministries.</li> </ul>
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•The Ministry in charge of Energy is entrusted with policy development, advised by the Energy Commission (Act 541, Art. 2). As the technical regulator, the EC prepares, reviews, and updates indicative national plans on a periodic basis (Act 541, Art. 2).</li> <li>•The REMP was developed by a taskforce of experts from the Ministry of Energy, the EC, the National Development Planning Commission, academia, and the United Nations Development Programme. This was a result of South-South Cooperation with China through a project funded by the Danish International Development Agency. The process involved consultations with the Ministries of Food and Agriculture, and Finance, T&amp;D entities, and national directorates/agencies in environment and standardization.</li> <li>•The REMP Coordinating Unit appointed by the Ministry of Energy as prescribed by Act 1045 (Art. 53) is vested with overseeing the implementation of RE activities in Ghana until a RE Authority is effectively established. The REMP states that the Coordinating Unit is "responsible for the overall procurement and fiscal management", which overrides with the function of the Public Procurement Authority (Act 663 as amended, 2016) mandated to develop rules, regulations, instructions, and standardized documentation, and ensure compliance of public procurement with information access rights (Art. 3).</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•Electricity sector policy and planning is <i>the State's</i> responsibility (Ordinance N°019 of 2000, Art. 6) whereas Art. 14 states that <i>the Ministry in charge of Energy</i> is responsible for developing rural electrification plans (Ordinance N°019, Art. 6).</li> <li>•The energy policy is to be updated every five years and the first update was planned after the latest PANER preparation. By Art. 7 of Ordinance N°019, the State is to publish an annual report on the results and the outlook for the electricity sector (not effective).</li> </ul>

Nigeria). While the former displays a policy ambition to reduce its dependence on thermal generation in the long-term, the latter seeks to leverage on gas-fueled generation to offset the climate-hydrology impacts of its hydrothermal fleet. Both envision not only expanding their supply capacity, but also maintaining their central role as power exporters in the region. Although from 2021, Burkina Faso has shown interest in Ghana's experience in gas-fueled electricity generation (Energies Media, 2021), it does not appear that the country's policy will take such direction, at least not in the medium term.

Fittingly, varying policy directions for the development of flexible generation infrastructure yield relatively distinct provisions of planning frameworks. In Burkina Faso, the scenario-based Master Plan for Generation and T&D 2017–2025 is based on demand forecasts and policy targets for electrification laid out in the National Economic and Social Development Plan, 2016–2020. Notwithstanding, it overlooks scenarios for fuel supply, which is currently 100% imported. Some new (diesel) thermal plants are expected through IPPs, yet new generation capacity is mostly not clearly split between private/public sectors. As for regulatory frameworks, by Law N°032 and its implementing Decree N°1337, the private partner shall be selected through international or national competitive bidding. Uncompetitive bidding is allowed on specific conditions including the urgency of service delivery. Unsolicited offers are permitted. They are also entitled to special incentives additionally to applicable tax and customs advantages, depending on the nature of the investment or the project to be implemented. Tenderers must specify the local content of the PPP project (share of local goods and services, committed share of outsourced local small and medium enterprises in

**Table 3**  
Processes of regulatory frameworks for RE portfolio development.

	Regulation for RE portfolio development
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•Modalities for RE grid integration are set by decree of the Council of Ministers (Law N°014, Art.62) yet no such decree was found in the public domain.</li> <li>•A contract between RE producers and the Transmission System Operator (TSO) (currently the state-owned utility) which defines the technical and financial modalities for grid connection is compulsory (Law N°014, Art.63).</li> <li>•Since 2013, RE equipment imports have been exempted from VAT and customs duties by Law N°051 on the execution of the state budget.</li> </ul>
<b>Côte d'Ivoire</b>	No specific implementing guidelines exist for grid-connected RE.
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•In 2015, Act 832 was operationalized through specific technical guidelines for RE integration into the grid provided by two Renewable Energy Sub-Codes, one for the transmission network and the other one for the distribution network.</li> <li>•The Local Content and Local Participation Regulations (LI 2354) of 2017 applicable to the electricity supply industry (including RE) were developed by the EC.</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•Art. 13 of Decree N°184 states that a Ministerial Ruling on technical rules for management and access to the transmission network defines, <i>inter alia</i>, priority levels for RE or cogeneration power plants, operating rules for congestion management issues and generation unit failure.</li> <li>•From the PANER, it was planned to revise Ordinance N°019 by 2017 to provide for specific authorization and concession regimes for RE. This is still pending.</li> <li>•The PANER intended that cost incentives for RE equipment imports would be implemented by 2017. It was only in 2020 that Ordinance N°012 applied an exemption for VAT and customs duties on imported RE equipment.</li> </ul>

project implementation, share and technical roles of local employees, proposed technology, and knowledge transfer modalities) (Decree N°1337, Art.34). A list of minimum technical (including local content) and financial criteria are stipulated by Art. 52 of Decree N°1337 in addition to project-specific criteria set by the contracting authority.

Côte d'Ivoire's Master Plan for Electricity Generation and Transmission, 2014–2030 reflects the government's policy to limit dependence on natural gas to 60% by 2030 (from over the current 80% share). Combined-cycle gas power plants with higher operational efficiencies are in the pipeline. The Master Plan features long-term modeling with two scenarios based on (local or Nigeria-imported) gas and coal supply, and accounting for the stated policy targets for RE installed capacity by 2030. It uses annual demand forecasts based on Gross Domestic Product growth estimates. No criteria for allocating future generation capacity development to the power utility or the private sector are provided. Article 9 of Decree N°358 of 2018 stipulates that PPPs are a tool for local enterprise development governed by the principles of fairness, transparency, competition, and public spending optimization. Tendering is the privileged procurement method. IPPs belong to the category for which tenderer selection is based on least-cost criteria (Art. 13, Decree N°358), with no specific requirements on local content. Direct negotiation is allowed when there is only one tenderer or in case of (*inter alia*) a major emergency. This shall be conducted within a framework document prepared by the contracting authority with the prior validation of the National Steering Committee of PPPs (CNP-PPP), yet no minimum evaluation criteria are provided by Decree N°358. Moreover, the roles of sectoral regulators and the national public procurement control authority are undefined in the decree.

In Ghana, the 2020–2030 SNEP is an update of the 2006–2020 version, guided by the goals of the 2010 energy policy and economy-wide policies and programs. It is a scenario-based plan employing a simulation tool that combines supply-driven and demand-driven approaches. The 2023–2040 IPSMP for power sector development is a long-term scenario-based least-cost modeling that provides an outlook on the future of generation and transmission development strongly

linked with infrastructure investment. It includes scenarios for oil price forecasts, domestic gas and West African Gas Pipeline supply and prices. A zonal approach for characterizing supply and demand is adopted to be consistent with the need for locational marginal pricing in the wholesale electricity market. The “Diversify geographically” (different from the REMP targets) is selected as the least-regrets strategy of the IPSMP considering a range of policy objectives such as cost, reliability, land use, resilience, and climate. It involves a higher growth of new grid-connected RE than thermal (mainly combined-cycle gas). The strategy includes the optimal commissioning years with timelines for development from procurement to construction. Still, no criteria or guidelines for allocating or splitting new generation capacity between the public and private sectors are provided. Regulations on procurement of new generation capacity define minimum evaluation criteria ranging from technical, financial, and commercial to service quality (Act 1039, Art. 44). Also, local content, local enterprise participation, and technology transfer must be reflected in PPP projects (Art. 10), and the contracting authority may apply a margin of preference for domestic businesses (Art. 45). Regulations LI 2354 on Local Content and Local Participation (LCLP) set specific targets for each segment: wholesale power supply, RE, distribution, sales, and transmission.

As for Mali, the Master Plan for Demand and Optimal Investment in the Electricity Sector, 2015–2035 propounds a methodology that does not model potential techno-economic futures, and the results are not explicitly linked to procurement timelines. New generation capacity builds are split between the public and private sectors, but no allocation criteria are provided. All new builds on PPP modality are subject to the provisions of the implementing decree of Law N°061. Unsolicited offers for PPP projects are allowed when no such PPP has yet been initiated for the project and it is not included in an investment program. Evaluation is done by an Assessment Commission similarly to a ‘normal’ tender process under the same evaluation criteria (Decree N°057, Art. 25). Art.8 of Decree N°184 lists non-exhaustive criteria for concession grants and overlooks local content.

Table 5 and Table 6, respectively, present the processes of planning and regulation for the development of flexible generation infrastructure.

#### 4.4. Key enabler 3: Availability of cross-border transmission capacity

Each country involved in the development of interconnections is responsible for securing the necessary financing to build its portion of the line. In West Africa, investment in regional interconnections is, among other things, hindered by the poor credit ratings of some countries, including Burkina Faso and Mali. For instance, the WAPP Coastal Transmission Backbone involving Nigeria, Benin, Togo, Ghana, and Côte d'Ivoire faced significant delays for the Togo segment because of a poor credit rating with a World Bank lending arm (WAPP, 2021). Furthermore, the regional Master Plans for Transmission appear to have followed a business-as-usual approach with typically importing countries on the one hand (of which Burkina Faso and Mali) and exporting countries (including Côte d'Ivoire and Ghana) on the other hand. Indeed, all existing (and planned, except for the Ghana-Burkina Faso--Mali) interconnections between the four countries are single-circuit lines that do not allow power to flow from Burkina Faso and Mali, despite their potential for leading utility scale RE scale-up in the region. It seems that this regional categorization extends to national perceptions given that such countries have no explicit statement on export prospects with PV and wind development. Rather, their policies rely on sustained (or increased) power imports. Table 7 summarizes national policies on (cross-border) transmission infrastructure.

This policy tendency holds truth for national plans. Burkina Faso's 2017–2025 Master Plan for Transmission envisions that electricity imports should be guaranteed at 58% of peak demand by 2025. As such, the transmission subsector requires reinforcements and extensions of which 64% have secured funding (Ministry of Energy-Burkina Faso, 2017). The Master Plan does not consider scenarios for the expected commissioning



**Table 4**  
Mapping of policies for flexibility sources of supply..

<p>Mali’s energy policy places its largest bet on regional power plants with no policy direction towards a more flexible fleet to integrate the greater shares of solar PV and wind expected in the generation mix. These power plants include large hydro reservoirs from the sub-regional cooperation between OMVS (Senegal River Basin Development Authority) States i.e., Guinea, Mali, Mauritania, and Senegal.</p>		<p>The national policy aims to reduce its energy dependence by tapping into its PV endowment. There are currently no plans for developing gas-fueled power generation. Burkina Faso aims to take advantage of its crossroads position in the envisioned regional transmission network to benefit from regional power plants and play a major role in the regional market.</p>
<p>The Government’s policy is to avoid overdependence on a single source and to meet the country’s CO<sub>2</sub> pledge under the Paris Agreement to cut GHG emissions by 28% by 2030. Hence, it is envisioned to keep the share of thermal generation and hydropower generation below 60% each, and to reach 20% renewables (solar PV and biomass) of peak demand.</p>		<p>The National Energy Policy (2010) sets a specific objective to improve the existing hydrothermal fleet and promote private sector participation. It does not specifically target flexible plants such as pumped hydro or gas-fueled for higher grid integration of PV and wind. Yet, there is a stated policy direction on securing fuel supply with a focus on natural gas.</p>

dates of interconnections and most of them are already suffering delays. In Mali, the 2015–2035 Master Plan highlights the country’s dependence on the effective implementation of cross-border interconnections in the medium-to long-term. As for Côte d’Ivoire, the 2014–2030 National Master Plan for Electricity Transmission reveals that the country aims to remain a central energy hub in the region, providing to “the countries of the North [including Burkina Faso and Mali], which lack energy resources, and the countries of the East [of which Ghana], which have gas resources but few hydroelectric resources”. (CI-Energies, JICA, 2019). The IPSMP 2023 reiterates the policy goal for Ghana to become a major net power exporter in West Africa (by decreasing imports while increasing exports) while fully meeting domestic demand. IPSMP’s specific objectives include meeting commitment to exports, EE and demand-side management programs, as well as climate change commitments. Investments in the interconnected national transmission system are subject to the National Electricity Grid Code of 2009, which aims at ensuring that the national interconnected transmission system “provides fair, transparent, non-discriminatory, safe, reliable, secure and cost-efficient delivery of electrical energy.”

From a regulatory perspective, the T&D segments remain under the monopoly of Burkina Faso’s incumbent within its operating zone and IPPs in Burkina Faso are entitled to grid access under network security

and service payment conditions (Law N°014, Art.38). By Art. 7 of the implementing decree of Law N°014, any IPP is required to provide all necessary data for grid integration studies and to support the costs of studies and infrastructure connection to the transmission network. Côte d’Ivoire’s Electricity Code provides that access to the transmission infrastructure is subject to the written authorization of the Minister of Energy upon prior approval of the TSO’s technical conditions by all relevant departments of the Ministry. Transmission and dispatch are based on non-discrimination unless for security reasons substantiated by the regulator. As the sole licensed electricity transmission utility, Ghana’s GRIDCo conducts the dispatch based on economic merit order and delivers power from all power generating companies to licensed bulk customers, and to the export market. In Mali, Ordinance N°019 requires the TSO to provide grid access to new operators who make such a request, and according to the associated technical norms. While grid access is defined by the non-discrimination principle, preferential tariffs may be applied by the TSO based on “objective differences” between IPPs and/or distribution operators (Ordinance N°019, Art. 23).

The processes of planning and regulation are described in Table 8 and Table 9, respectively.

**Table 5**  
Processes of planning for flexibility sources of supply.

	Planning for flexibility sources of supply
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•The Ministry of Energy is entrusted with producing 10-year indicative plans (to be updated every 3 years) for new generation, after consultation with the TSO and distributors, and requiring the regulator's simple opinion (Art. 30, Law N°014).</li> <li>•The 2017–2025 Master Plan involved a consultation process with public power utilities, the regulatory authority, and other centralized institutions and (unspecified) actors.</li> </ul>
<b>Côte d'Ivoire</b>	<ul style="list-style-type: none"> <li>•Decree N° 472 of 2011 instituted the state-owned company CI-Energies, responsible for (<i>inter alia</i>) supply and demand planning, in coordination with the Ministry of Energy (Art. 2). By Art. 6 of Decree N° 785, the regulator delivers an opinion on electricity investment planning.</li> <li>•Belgian consulting firm Tractebel-Engie was contracted to develop the current Generation Master Plan. The periodicity of updates is undefined.</li> </ul>
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•By Act 541, the EC is entrusted with preparing, reviewing, and updating indicative national plans.</li> <li>•The 2023 update of the IPSMP (from the 2018 and 2019 versions) was led by the Energy Commission with USAID's technical and financial support. The modeling tool was provided by a US-based advisory and technology services provider. Various power sector actors (public generation entities, TSO, distributors, and the two oil and gas national companies) actively participated in the update process, mainly for data provision. The update process received the guidance and support of the Ministry in charge of Energy. All these stakeholders formed the Power Planning Technical Committee (PPTC) in 2020. The PPTC, chaired by the Energy Commission and GridCo, also produces Annual Electricity Supply Plans.</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•The current Master Plan was developed by the Ministry in charge of Energy with the technical support of French consulting firm, Artelia. It is not publicly available.</li> <li>•The electricity regulator may be part of the preparation process for the sector's planning (Ordinance N°021, Art. 5).</li> <li>•By Decree N°184, the transmission concessionaire is to develop an annual generation &amp; transmission programming document considering annual hydrology data. This forms the basis for tariff proposals to the regulator.</li> </ul>

#### 4.5. Summary of country assessment and comparison

The weaknesses in terms of substance, process, and consistency with the regional vision are summarized in [Table 10](#) for policy, [Table 11](#) for planning and [Table 12](#) for regulatory frameworks.

#### 5. Proposals for improved and harmonized frameworks

Considering the weaknesses identified in [Table 10](#), [Tables 11 and 12](#), proposals are made for improving the substance and processes of country policies, investment planning and regulation, particularly considering the burgeoning involvement of the private sector in developing utility-scale RE. The proposals are three-fold: (i) Sound RE policy and investment planning; (ii) Quality regulation for utility-scale RE procurement and; (iii) Empowered role of regional institutions.

##### (i) Sound RE policy and investment planning

To be successful, the regional power integration agenda must be mainstreamed in the national mandates of Member States through policy and their implementing tools. In other words, participating countries in the power pool must have a regional outlook, with full ownership of regional plans. All versions of the regional master plan have historically been developed with non-West African expertise, and consistently revised either due to unexpected demand growth, energy supply crisis, or non-consideration of low marginal cost RE sources, leading to significant deviations from national and regional plans. In such a context, it is paramount to strengthen the regional expertise in cross-border trade modeling alongside creating an information exchange platform between WAPP experts and national policymakers and planners. This platform

**Table 6**  
Processes of regulation for flexible sources of supply.

	Regulation for flexible sources of supply
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•Authorizations and licenses for generation are granted by the Ministry of Energy, subject to the regulator's assent (Law N°014, Art. 26).</li> <li>•Law N°032 instituted a PPP Unit within the Ministry in charge of Finance to provide expert advice and technical assistance to the contracting authority. All preliminary studies shall be approved by the PPP unit. Any validated project shall be included in the national integrated PPP database. The contracting authority is required to establish a focal point and a PPP Cell, both interacting with the national PPP Unit for the project implementation (Art.9).</li> <li>•The sectoral regulator's assent is required during any PPP project preparation leading to competitive bidding (Decree N°1337, Art. 15). Restricted bidding and direct negotiation are subject to the assent of the public procurement control authority. The PPP Selection Committee is established by the Ruling of the Ministry of Finance (Art. 40).</li> <li>•PPP contract signatories include local authorities and budget authorizing officers on top of the sector minister. The final signature is by the Minister of Finance following the PPP Unit's assent and the visa of the authority for public procurement control (Decree N°1337, Art. 70).</li> </ul>
<b>Côte d'Ivoire</b>	<ul style="list-style-type: none"> <li>•Ministerial Ruling N°329 of 2022 instituted a committee in charge of evaluating authorization and license requests (including for independent and self-generation) (Art. 2). The Committee is chaired by the Director General for Energy and membership includes one official each from CI-Energies and the sectoral regulator (Art. 5). The Committee provides its reasoned opinion to the Minister for the granting of authorizations and licenses, which are signed by the Minister of Energy (Art. 4).</li> <li>•By Decree N°359 (March 2018), the CNP-PPP has an advisory and expertise function. Any feasibility study not performed by the CNP-PPP shall be transmitted (with no mention of approval) to the latter by the contracting authorities. By Decree 358 (March 2018), CNP-PPP's approval of all preliminary studies is compulsory (Arts. 10 &amp; 11). Draft PPP contracts are subject to CNP-PPP's non-objection notice prior to being signed and approved by decree by the Council of Ministers (Art. 24).</li> </ul>
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•By Act 1039 of 2020, competitive bidding is the preferred procurement method for PPPs, but unsolicited proposals are allowed (Art. 7).</li> <li>•A PPP Committee chaired by the Minister and including two Ministers (Justice and Trade &amp; Industry) and other high-level ranking officials, is vested with approving PPPs, feasibility studies, bid evaluation reports, etc. (Arts. 19, 20, 21). Stakeholder consultation by the contracting authority is mandatory for each stage of the procurement process with no mention of the role of sectoral regulators (Art. 8).</li> <li>•Any prospective PPP project of state-owned enterprises is appraised by the Public Investment Unit of its respective Ministry prior to its submission to the Cabinet (made up of up to 19 Ministers) and its final approval is done by the Parliament (Arts. 12, 13, 14). The LCLP Committee oversees the effective implementation of the local content regulations. It is chaired by the Energy Commission, with representatives from three ministries (<i>inter alia</i>): energy, employment, trade &amp; industry.</li> <li>•By Art. 26(4) of the Ghana Investment Promotion Centre Act (Act 865, 2013), specific incentive packages may be negotiated for strategic and major investments, in addition to applicable fiscal and customs advantages under other laws.</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•Generation concessions are granted by the Ministry of Energy through a tendering process (Ordinance N°019, Art. 17) subject to the electricity regulator's assent (Ordinance N°021 of 2000). This may involve consultation with another relevant Ministry.</li> <li>•The State is responsible for opening competitive bidding for concession, granting concessions and authorizations (Ordinance N°019, Art. 7). Contracting authorities may state their intention to implement a PPP by publishing a pre-notice following the template fixed by the decision of the West African Monetary Union (Decree N°057, Art. 7).</li> <li>•The tendering process may be one- or two-stage. During a one-stage process, no discussion with tenderers is allowed except by writing to specify the substance of their bids (Decree N°057, Art. 14). In case of a two-stage process, dialogue modalities shall be indicated in the tender document but no guidelines on such modalities are provided.</li> </ul>

(continued on next page)

Table 6 (continued)


Regulation for flexible sources of supply
<p>•Law N°061 of 2016 established a national PPP unit. By Art. 3, a preliminary assessment of the PPP project must be submitted to the PPP unit, the Ministry of Economy and Finance, and the sectoral regulator. In addition, two studies on the implementation model and budget sustainability are required, with no definition of responsibility.</p> <p>•By Art. 6 of Law N°061, a Tendering Commission is established, and chaired by the contracting authority. The sectoral regulators are not listed as members. The Minister of Economy and the sectoral minister are the final signatories of the PPP project, which is then approved by the Council of Ministers. The authority for public procurement control and the PPP unit both receive the signed contract for information.</p> <p>•By Decree N°057, tax and customs incentives are provided depending on the size of the project as well as additional incentives for projects with at least 60% of local content (non-technology specific).</p>

would provide national planners and policymakers with exposure to robust evidence on the missed opportunities from resource-driven development of RE-based electricity and VRE generation spillage undermined by business-as-usual regional power exchanges. It would, thus, allow traditional importing countries with high RE endowment to voice out their ambitions to play a key regional role in scaling up and trading RE generation, while traditional exporting countries would have their awareness raised on taking advantage of lower marginal costs from RE generation in the former countries. The ultimate (medium to long-

term) objective should be to develop sufficient national and regional human and technical capacities for “in-house” development of regional and national plans.

- Up-to-date energy policies are needed in all countries, but particularly in Ghana and Côte d’Ivoire. Such policies should embed provisions for RE development with clear targets and prioritized specific objectives considering financing constraints, rather than a long list of potential lines of action, as is the case for Mali and Burkina Faso. Prioritization could be done using multicriteria decision-making models as described in (Bissiri et al., 2020). Moreover, it is paramount that (renewable) energy policies mainstream relevant economy-wide policies, and vice-versa, to facilitate the identification of synergetic cross-sectoral policy actions.
- Countries should develop dynamic planning processes following a Plan-Do-Check-Act approach with regular updates as the electricity sector and the market evolve, with systematic economy-wide stakeholder consultations, including the local private sector. A shift towards Integrated Resource Plans (IRPs) appears highly relevant, considering the stated (in Ghana) and implicit policy intentions of developing a sustainable “Energy Economy”, building upon the RE sector to expand the local RE supply chain, manufacturing base, and sector knowledge. South Africa’s experience of IRPs can also provide relevant insights into this process. The vision for IRPs should be to integrate national socio-economic development and regional

Table 7  
Mapping of policies on (cross-border) transmission infrastructure.

<p>The 2013 energy policy identifies the development of the national transmission network as one of its 14 priorities, including the creation of a dispatch center.</p>		<p>The 2014-2025 energy policy considers the reinforcement of the national interconnected network and the development of cross-border interconnections as the first Action of its Energy Subprogram.</p>
<p>Through its national development policy, the country envisions playing a central</p>		<p>Ghana aims to become a net power exporter through the reinforcement/upgrade of its</p>
<p>exporter role in the regional interconnected network while satisfying rising electricity demand. The Northern region (with the highest PV endowment), which has one of the weakest transmission infrastructure, has been included in the three Special Economic Zones and is therefore expected to witness significant investment in (transmission) infrastructure alongside PV development.</p>	<p>national transmission infrastructure. Through its liberalization policy of the distribution segment now open to private operators, the country seeks to improve service quality and reliability, hence the financial viability of T&amp;D operators, which is a crucial determinant for attracting private sector investment.</p>	

**Table 8**  
Processes of planning for (cross-border) transmission infrastructure.

	Planning for (cross-border) transmission capacity
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•The state-owned TSO, SONABEL, is responsible for transmission infrastructure development, operation, maintenance, dispatching, and implementing contracts for tier grid access (Law N°014, Art. 34). SONABEL periodically produces their own transmission roadmaps, which inform the National Master Plan for Generation and Transmission.</li> </ul>
<b>Côte d'Ivoire</b>	<ul style="list-style-type: none"> <li>•The power utility under private concession, CIE, is currently responsible for network operations, electricity dispatch, transmission, distribution, retail, and trade, servicing and repair of network facilities, and customer management operations.</li> </ul>
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•As the technical regulator, the EC is responsible for electricity sector planning.</li> <li>•By the Grid Code, the operator of the transmission system (GridCo) is considered an Independent System Operator (ISO) and as such, is subject to the best ISO practices.</li> <li>•GridCo co-chairs the PPTC with the EC which produces Annual Electricity Supply Plans which provide an operation outlook of Ghana's power system.</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•The state-owned power utility, Electricité du Mali (EDM) is the only concessionaire of the national interconnected network, with a monopoly over T&amp;D, retail, and imports. EDM is responsible for transmission planning.</li> <li>•In consultation with other operators connected to their transmission network, the transmission concessionaire is required to develop a ten-year scenario-based transmission plan according to generation scenarios, including generation capacity and imports from neighboring countries (to be adjusted every two years). The plan is to be approved by the regulator before submission to the Minister in charge of Energy (Decree N°184, Art. 13).</li> </ul>

energy integration ambitions, explicitly encompass flexibility sources for RE integration (from the supply and demand sides) and clearly allocate the shares of new investments between the public and private sectors based on sound allocation criteria. Also, the IRPs should feature generation capacity expansion modeling similar to that used by Ghana's IPSMP, accounting for the objectives set in the NREAPs in order to evaluate their optimality levels under a set of cost, environmental and other economy-wide metrics, as well as integrating the spatialities of supply and demand through a zonal planning approach. Care should be taken to ensure that the RE potentialities of countries are adequately accounted for rather than instilling the perception of the need for higher import dependence of RE-rich countries. These IRPs should be explicitly connected to procurement and contracting in order to ensure timely power infrastructure development.

- All countries, except for Ghana, need to develop a national grid code with RE sub-codes to help increase transparency on RE grid integration modalities. Furthermore, the unbundling of the generation and transmission segments as prescribed by law should be made effective, particularly in Burkina Faso and Mali. In the shorter term, it is crucial that dispatch arrangements in the current single buyer model are clearly defined, documented, and implemented to take advantage of low marginal costs from RE generation.

(ii) Quality regulation for grid-connected RE procurement:

Countries should strengthen their focus on developing/enhancing RE-specific legal and regulatory substance and processes, with a focus on transparency and consistency to create an enabling environment for private sector participation:

- **Governance:** The structure of PPP arrangements in Burkina Faso highlights best practices for developing specific RE IPP frameworks in other countries. As in Burkina Faso (and to a lesser extent Côte d'Ivoire), RE IPP projects should be part of a larger PPP database spanning across all economic sectors. Taking into

**Table 9**  
Processes of regulation on (cross-border) transmission capacity.

	Regulation on (cross-border) transmission capacity
<b>Burkina Faso</b>	<ul style="list-style-type: none"> <li>•The technical rules for transmission network connection and operating rules are developed by the TSO and approved by ministerial ruling upon the regulator's assent (Law N°014, Art. 37). By Art.38, the modalities for grid access to (<i>inter alia</i>) generators and self-generators are set by decree of the Council of Ministers.</li> <li>•Grid access tariff proposals are made by the TSO to the Minister of Energy who sets such tariffs (by decree), after the regulator's assent. For IPPs, the final rate base and its revision modalities are defined by the purchase contract between the buyer and the generator (Art. 8 of the implementing decree of Law N°014).</li> <li>•The TSO is permitted to suspend tier access to the grid (on unspecified conditions) and shall provide justifications to the regulatory authority.</li> </ul>
<b>Côte d'Ivoire</b>	<ul style="list-style-type: none"> <li>•The regulator sets all tariffs pertaining to the electricity sector, including grid access tariffs (Decree N°785, Art. 5).</li> <li>•Section 4 of the Electricity Code provides that the TSO shall guarantee transit in accordance with the technical and economic conditions defined by the international conventions ratified by the State. The operator may disallow electricity transits only on grounds of verified technical and security constraints or as authorized by the regulator.</li> </ul>
<b>Ghana</b>	<ul style="list-style-type: none"> <li>•By Amendment Act 800 of 2010, the Public Utilities Regulatory Commission is responsible for economic regulation as it approves and implements efficient electricity tariffs.</li> <li>•Interconnections with other electricity networks of the WAPP shall comply with the provisions of the Grid Code, the ECOWAS Energy Protocol and the WAPP Operation Manual. The Grid Code requires the TSO to ensure the coordination of operations with WAPP and the General Secretariat to perform reliability studies of WAPP operations.</li> <li>•Section 30 of Act 832 states the obligation for a transmission or distribution operator to ensure grid access to any RE generator interested in feeding in electricity, and to perform the necessary network upgrades in a cost-effective manner to accommodate the RE generator. However, grid connection costs are borne by the RE generator.</li> </ul>
<b>Mali</b>	<ul style="list-style-type: none"> <li>•Art. 12 of Ordinance N°019 provides that power transmission via interconnections is subject to the provisions of the related international agreements.</li> <li>•The modalities and the tariffs of grid integration (including potential infrastructure upgrading costs) are negotiated between parties and must comply with the principles defined by the regulator. Art. 7(4) of the implementing decree of Ordinance N°019 obligates the concessionaire to ensure the maintenance of electricity facilities and, if need be, install new facilities and/or refurbish existing facilities according to the concession terms. It is unclear who bears the connection costs and reinforcement costs for integrating the generation into the grid.</li> </ul>

consideration the long-standing challenges of raising adequate investment levels in generation (and transmission) infrastructure, a more stakeholder-inclusive approach could help identify cross-sectoral synergies for formulating PPPs (including RE IPPs) that are more attractive for private sector investment while achieving national socio-economic goals. The PPP governance frameworks in Côte d'Ivoire and Mali should be revised in light of the other two countries' experiences. As well, the roles of technical and economic regulators should be reinforced throughout RE IPP procurement and contracting processes, in all countries except Burkina Faso. Among all countries, it is crucial for Mali to update the legal framework governing its electricity sector as the main legal instrument, Ordinance N°019, dates to nearly 25 years ago.

- **Competitive bidding:** In all countries, competitive bidding is the preferred procurement method expected to be applied to new RE IPP projects. While all countries have formally established PPP Units to provide technical and advisory assistance to contracting authorities, the lack of technical and human capacity to run (international) competitive bidding processes is implicitly acknowledged in all countries, with provisions for outsourcing specific expertise if needed. As part of its



**Table 10**  
Summary of substance and process weaknesses of policy frameworks by key enabler.

Key enabler	Policy weaknesses
RE portfolio development	<ul style="list-style-type: none"> <li>•All countries but Côte d'Ivoire have an official energy policy document with RE targets. In most countries, RE targets are not entirely clear on the role of utility scale versus off-grid self-generation and on-grid distributed generation. They may also appear rather arbitrary and too ambitious given their low actual implementation levels.</li> <li>•Only Ghana has a relatively strong local content policy (and specific targets) for the electricity and RE sectors which stems from the economy-wide ambitions, particularly local industry, and Research &amp; Development (R&amp;D), as well as investment promotion. This is consistent with regional ambitions. The other countries appear to focus on tax exemptions on RE equipment imports with no specific quantitative targets for RE-related local content and participation. Burkina Faso, for instance, has set up West Africa's first local manufacturing firm of PV panels (Traoré, 2020). Yet, such salutary initiatives which also reflect the regional vision of developing local industries, are not adequately mainstreamed into energy and economic policies.</li> </ul>
Flexibility of supply infrastructure	<ul style="list-style-type: none"> <li>•In Burkina Faso and Mali, urgent policy choices have resulted in a lock-in situation whereby power plants with low operating flexibility remain the backbone of the generation fleet. The outlook for the future power supply appears more business as usual than green compared to the RE endowment and scale-up potential.</li> <li>•Côte d'Ivoire and Ghana, endowed with natural gas resources along their Southern shores with access to the West African Gas Pipeline, have clear policies for expanding gas-fueled supply through more efficient technologies, although none explicitly states the need for such flexible generation to accommodate the increasing RE shares.</li> </ul>
Availability of cross-border transmission capacity	<ul style="list-style-type: none"> <li>•The traditional categorization of exporting versus importing countries linked with the extensive utilization of endogenous gas and water resources in Côte d'Ivoire and Ghana versus the poor development of PV and wind sources in Burkina Faso and Mali reflects the implementation of existing and future cross-border interconnections.</li> <li>•Policies in Burkina Faso and Mali tend to rely on this traditional categorization dictated by regional policy direction as they expect strong dependence on power imports while promoting wavering RE policies. The same applies to traditional exporters where policies are strongly directed towards expanding exports and strengthening their roles as main regional energy hubs. The mutual complementarity aim of the ECOWAS Energy Protocol is, thus, not streamlined into policies on transmission infrastructure.</li> </ul>

Renewable Energy Independent Power Producer Procurement Programme (REI4P) formulated as a replacement for the renewable energy FIT program and internationally recognized as best practice for RE promotion, South Africa demonstrated that the setup of a distinct procurement office by the Ministry of Energy (specifically the department in charge of sector planning) together with a pool of expert transaction advisers is key to promoting RE IPP investment. South Africa has a similar power sector structure (vertically integrated and state-owned power utility with monopoly on transmission, generation open to IPPs, existence of an independent regulatory authority) to Burkina Faso, Mali, and most other West African countries, and therefore, can serve as a replicable example.

**Table 11**  
Summary of substance and process weaknesses of planning frameworks by key enabler.

Key enabler	Planning weaknesses
RE portfolio development	<ul style="list-style-type: none"> <li>•All countries have developed NREAPs which account for the stated region policy targets for RE development. Yet, the optimality level of targets and the respective actions under the NREAPs can be argued. This is the case in Ghana where its 2019 REMP targets are found not to be the most optimal option for Ghana from a least-cost modeling perspective and a set of metrics translating potential techno-economic futures for the country (as reflected in the IPSMP, the main power sector planning document for the Ministry). Yet, human, technical, and financial resources are being allocated for implementing the REMP in parallel with the IPSMP.</li> <li>•Current RE planning is not based on robust techno-economic modeling (except for Ghana's IPSMP) and not linked with strong investment outlooks in terms of timelines including for procurement processes, as well as sound criteria for allocating new RE capacity to either the public or the private sector, and the expected split of new RE builds between these actors.</li> <li>•The process of RE planning appears to overlook stakeholder consultations with economy-wide actors, including private investors and local commercial banks. Even in Ghana where the REMP gathered a wide range of institutional actors, the industry/manufacturing sector appears absent despite its existing local content policy and regulations.</li> </ul>
Flexibility of supply infrastructure	<ul style="list-style-type: none"> <li>•Ghana has too many sectoral plans that are overall not consistent with one another.</li> <li>•Only Ghana boasts an integrated power sector planning document with rigorous techno-economic modeling including the spatial dimensions of supply and demand. The zonal approach of the IPSMP is consistent with the requirements of an efficient wholesale market as envisioned in the region. The development process and update periodicity of the IPSMP involve a wide range of actors, with a formally established committee co-chaired by the technical regulator (responsible for sector planning, adviser to the Ministry of Energy) and the TSO. In other countries, generation plans are not regularly updated as prescribed by legislation. In Côte d'Ivoire, the planning entity is state-owned and different from the TSO. The process and consultation practices are, however, unclear. In Burkina Faso, the Ministry of Energy is responsible for sector planning and the state-owned utility (combining generation, transmission, dispatching, and single buyer roles) develop their own generation and transmission roadmaps. The extent to which these processes are sufficiently transparent and optimal for effectively promoting private sector participation in generation is not clear.</li> <li>•In all countries, strategic planning documents provide no criteria or guidelines for allocating or splitting new generation capacity between the public and private sectors. Also, the implementation of planned generation is generally not explicitly linked to their respective procurement and contracting timelines.</li> </ul>
Availability of cross-border transmission capacity	<ul style="list-style-type: none"> <li>•In all countries, grid access is legally based on non-discrimination, in line with the WAPP principle, yet only Ghana's frameworks make specific provisions for grid access (and operations) by RE IPPs both in its RE law and through RE sub-code for transmission and distribution.</li> <li>•In all countries, grid access tariffs are endorsed by the national regulator. Yet, in Mali, such tariffs are</li> </ul>

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Table 11 (continued)

Key enabler	Planning weaknesses
	<p>modifiable at the discretion of the TSO, based on “objective differences”, which are not defined. Only Ghana has clear obligations for the national TSO/ISO to collaborate with the regional regulator and comply with WAPP regulations. The Côte d’Ivoire Electricity Code points to “ratified international conventions” with no specific mention of the WAPP. This lacks in the case of Burkina Faso and Mali.</p>

- Remuneration and cost allocation mechanisms:** considering the current weak development of national markets in the WAPP, a thorough analysis of local market contexts against experiences and lessons learned from European, Latin American, and Northern American regions. Ghana’s tendering process with competitive auctions with local content dimensions implemented under the close supervision of the regulatory authorities offers a relevant example of investment incentives for RE generation assets. As well, such promotion schemes should evolve with stronger regulatory frameworks for congestion management and ancillary services to cope with RE-induced system imbalances. Moreover, as the technological learning curve of RE sources evolves and further drives down capital expenditure levels, the region should aim to rapidly shift away from (budget-constraining) subsidies. With the low marginal costs of RE generation, adequate compensation mechanisms for the differences between revenues from wholesale market prices and investment costs should be carefully designed and implemented to generate adequate levels of return on investment and create investment incentives in the long run. Additionally, as large-scale RE deployment adds a challenging element to existing transmission regulation paradigms, new approaches are needed to guarantee the cost efficiency of RE power plants (especially those located far from demand centers) by assigning adequate transmission charges. Regional power projects involve high capital costs and distributed benefits among several stakeholders, thus reaching an agreement on cost allocation of regional power infrastructure is key for raising adequate investment. Hence, WAPP countries must endeavor to develop a suitable regulatory design of transmission charges in the context of increasing penetration of regionally-oriented RE generation in transmission systems.

- Local content:** RE IPP procurement in all countries must enhance their local content and participation dimensions. Recalling the cross-cutting nature of energy access, it is paramount that the RE and power sectors are effectively leveraged to fuel progress across socio-economic sectors, particularly industry/manufacturing, R&D, education/vocational training, etc. The existence of legally backed regulations with clear and specific targets across the RE supply chain, mainstreamed into Ghana’s PPP frameworks (as applicable to the RE sector) uncover best practices for other countries. Furthermore, South Africa’s REI4P boasts a widely hailed approach to integrating local content in IPP procurement processes, which may well inspire sound RE IPP frameworks in the case study countries.

(iii) Empowered role of regional institutions

- ECOWAS should support the development of a Practical Guide to Energy Policy Design and Implementation aimed at the planning units of the ministries in charge of Energy and regulators in its member countries. The Guide would cover the fundamentals of energy policy, its articulation with economy-wide and climate action policies as well as the mainstreaming of regional power integration objectives. This should be based on the prior identification and mapping of the weaknesses and

Table 12

Summary of substance and process weaknesses of regulatory frameworks by key enabler.

Key enabler	Regulatory weaknesses
RE portfolio development	<ul style="list-style-type: none"> <li>All countries have liberalized the generation segment, allowing RE IPP participation. New RE IPP builds are subject to the laws and regulations on PPPs which all promote competitive bidding as the preferred procurement method, in line with the regional vision. There are, however, currently no specific procurement frameworks for RE IPPs and specific authorization and concession regimes for RE.</li> <li>Only Burkina Faso’s PPP governance and implementation framework involves local authorities (regional and municipal) in the signature process of any PPP contract, even when the PPP project is not initiated by a local government authority. Local government appraisal and signature are important for RE development in terms of land acquisition, use, and community acceptance.</li> <li>The national regulatory documents currently do not make provisions on the remuneration of RE generators and infrastructure cost recovery for RE grid integration.</li> </ul>
Flexibility of supply infrastructure	<ul style="list-style-type: none"> <li>In all countries, the regulator is either actively involved in power system planning (Ghana), may be involved (Mali), or delivers an opinion (Burkina Faso and Côte d’Ivoire). Stakeholder consultation is clearly defined in Burkina Faso and Ghana, whereas it is rather unclear in Côte d’Ivoire and Mali.</li> <li>The process for the granting of generation licenses is not uniform and only Ghana conforms to the regional rules (defined in Section 8.06 (b) in (ERERA, 2017)). In Ghana, licenses are granted by the technical regulator, EC, which is also in charge of power sector planning. In Burkina Faso and Mali, licenses are subject to the regulator’s assent before being granted by the Minister of Energy. In Côte d’Ivoire, the Minister of Energy grants licenses subject to the reasoned opinion of an evaluation committee chaired by the Director General for Energy. The regulator only participates as a member of the committee.</li> <li>The institutional governance and processes of PPPs are stipulated by law and implementing decrees in all countries, but Burkina Faso and Ghana both stand out with more detailed structures and clearer definitions of roles and responsibilities. The assent of sectoral regulators during PPP processes is not provided for, except in Burkina Faso. Only Côte d’Ivoire does not provide minimum evaluation criteria for PPP projects and the functions of its PPP Unit (the CNP-PPP) are not consistent between two decrees that were published simultaneously. Meetings of tenderers under clear rules and processes are only provided for in Burkina Faso and Ghana. In Mali, a 2017 decree stipulates that tender publication must follow a template of a sub-regional organization (with eight Member States, excluding Ghana) different from ECOWAS.</li> </ul>
Availability of cross-border transmission capacity	<ul style="list-style-type: none"> <li>Domestic access to the grid is based on the traditional model whereby the incumbent (or the private operator in Côte d’Ivoire) is the single buyer. The national TSO is responsible for dispatch but only Ghana explicitly states that dispatch is based on economic merit. This lack of clarity and transparency of dispatch rules under the single buyer model could be limiting factors for RE IPP generation. Even with Take-or-Pay PPA contracts, the poor financial standing of off-takers may still pose a revenue risk to RE IPPs, leading to weak private sector involvement despite RE resource endowment.</li> </ul>

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Table 12 (continued)

Key enabler	Regulatory weaknesses
	<ul style="list-style-type: none"> <li>• In Burkina Faso, the TSO is legally permitted to suspend grid access to a third-party, but there are no provisions for failure situations such as those induced by the intermittent nature of RE generation.</li> </ul>

threats of current energy policies in Member States, but also on their strengths to leverage on best practices and raise awareness of opportunities. The Guide should propound three main components of the conceptual framework, policy processes, and implementation guidelines.

- ECREEE should further assist the ministries in charge of Energy in mainstreaming the NREAPs into their respective wider energy policies while ensuring nationwide ownership of the NREAP which would ultimately stand as the single national plan for RE development. This should also aim to help strengthen national consensus on regional power integration for both traditional importers/exporters, as per the ECOWAS Energy Protocol's vision of effectively taking advantage of resource complementarities.
- As per its mandate, ERERA, in collaboration with the WAPP, should provide technical support to national regulatory authorities in developing and implementing a region-wide diagnostic of national electricity market arrangements. This will significantly support the identification and implementation process of the most appropriate schemes for promoting long-term investment in RE and flexible generation assets at the national level, against an agreed regional approach. For regional coordination and convergence, regulatory guidelines should then be developed to inform the design process of such national schemes, with final clearance and approval by ERERA.
- A Renewable Energy Acceleration Unit should be established within the WAPP planning department alongside a dedicated PPP Cell, collaborating with the regional regulator, ERERA. The RE Acceleration Unit-PPP Cell combination should be formally established in the WAPP governance framework and vested with the responsibilities of providing technical assistance to national PPP Units throughout RE IPP procurement processes (including the preparation of standardized (pre-) notice and tender documents), particularly for new RE investments, as well as advisory support during PPA negotiations and technical capacity building of utilities for sound planning. These arrangements could also serve as a platform to develop effective mechanisms for co-sharing best practices and lessons learned between Member States, including with early pioneer countries holding successful track records in RE IPP development in the Southern and Eastern African Power Pools such as South Africa, Kenya and Uganda.

## 6. Conclusions and policy implications

The findings of this study are coherent with the scholarly literature on the lack of sound policy and power system planning processes in sub-Saharan Africa, including West Africa. It, however, presents deeper insights into the provisions of such plans, and the processes and practices backed by legislation, using a subset of four interconnected countries of the WAPP with power system structures that are representative of the remaining Member States. The study also contributes to expanding the sparse scholarly footprint of these countries in the area of legal and regulatory provisions and processes, in the context of scaling up utility-scale RE through the promotion of private sector investment. Overall, despite stated national policy intentions to tap into the region's vast RE

endowment to mutually benefit sufficient, reliable, and affordable access to electricity, the case study countries are characterized by half-hearted RE policies, weak RE investment planning and inconsistent regulations. As well, the substance and processes of their regulatory frameworks are found to be mostly misaligned with the regional vision of RE development and cross-border power trade.

Notwithstanding, these discrepancies and challenges should be seen as opportunities for co-creating policy and regulatory environments conducive to the implementation of the envisioned regional electricity market. As such, a three-pronged proposal is made, namely sound RE policy and investment planning, quality regulation for grid-connected RE procurement, and the empowered role of regional institutions. The pillars of this proposal must be simultaneously addressed and require that countries be fully committed and duly equipped to improve their policies and planning processes, and adjust, and harmonize their regulatory frameworks. This must be done under the guidance, support, and leadership of the regional entities to strengthen effective collaboration between countries for sharing knowledge and best practices, and to adjust policy and their implementing tools to be in line with the regional vision. Future research should conduct project-level analysis of RE IPP projects to further underscore the actual practices in procurement and contracting, beyond the legally backed regulatory provisions and processes. Furthermore, an analysis of regulatory practices in terms of the remuneration of RE-based generation and the cost recovery of RE grid integration would provide additional insights into the regulatory changes needed to scale up RE generation at the regional level. Also, the legally backed promotion of self-generation, in particular through solar PV, will, if effective in the medium-to long-term, add to the challenge of forecasting demand for power system planning. This should also be a future research avenue alongside the rising promotion of demand-side management as a flexibility source for RE grid integration.

## CRedit authorship contribution statement

**Mounirah Bissiri:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Patrícia Pereira da Silva:** Writing – review & editing, Validation, Supervision. **Pedro Moura:** Writing – review & editing, Validation, Supervision. **Nuno Carvalho Figueiredo:** Writing – review & editing, Validation, Supervision.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

No data was used for the research described in the article.

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Appendix

**Table A.1**  
Detailed structure of the assessment framework

	Policy	Planning		Regulation	
		Substance	Processes	Substance	Processes
<b>Key enabler 1: RE portfolio development</b>	<ul style="list-style-type: none"> <li>•What are the energy sector policy provisions for RE and their alignment with economy-wide policies?</li> <li>•What are the NDCs document provisions for RE deployment based on GHG emissions reduction targets/climate change policy?</li> <li>•What is the expected country's qualitative role in RE scale-up at the regional level?</li> </ul>	<ul style="list-style-type: none"> <li>•What is the action plan for RE: are the targets clear? How are they aligned with existing timelines of wider national development plans?</li> <li>•Does the national action plan for RE contain detailed supply and demand forecasts with scenario-based least-cost generation? Are the spatial distributions of RE supply accounted for?</li> <li>•Are there criteria for allocating new RE capacity generation assets to either the state-owned utility or the private sector?</li> </ul>	<ul style="list-style-type: none"> <li>•Who is legally in charge of RE planning?</li> <li>•How are RE planning and update processes performed?</li> <li>•Are there consultations with economy-wide stakeholders?</li> </ul>	<ul style="list-style-type: none"> <li>•What are the legal provisions for private sector participation? What are the bidding and procurement processes for new RE capacity generation?</li> <li>•Is there any competitive tendering mandated by the regulator?</li> <li>•What are the legal provisions for RE incentives?</li> </ul>	<ul style="list-style-type: none"> <li>•Who is legally in charge of RE subsector regulation?</li> <li>•Are there implementing guidelines for RE incentives?</li> <li>•Are there implementation guidelines for PPPs and IPPs for new RE capacity builds?</li> </ul>
<b>Key enabler 2: Flexibility of existing (and planned) generation</b>	<ul style="list-style-type: none"> <li>•What are the national policy provisions for flexible generation plants?</li> </ul>	<ul style="list-style-type: none"> <li>•Is there any national generation investment plan? How is it integrated into the wider energy policy?</li> <li>•Does the generation investment plan contain detailed scenario-based supply and demand forecasts?</li> <li>•Are there scenarios for fuel supply?</li> <li>•Are there criteria for allocating new flexibility generation assets to either the state-owned utility or the private sector?</li> </ul>	<ul style="list-style-type: none"> <li>•Who is legally in charge of flexible generation planning?</li> <li>•How are flexible generation planning and update processes performed?</li> <li>•Are there consultations with economy-wide stakeholders?</li> </ul>	<ul style="list-style-type: none"> <li>•What are the legal provisions for private sector participation? What are the bidding and procurement processes for new flexible generation capacity?</li> <li>•Is there any competitive tendering mandated by the regulator?</li> <li>•What are the legal provisions for RE incentives?</li> </ul>	<ul style="list-style-type: none"> <li>•Who is legally in charge of flexible generation regulation?</li> <li>•Are there implementing guidelines for flexible generation incentives?</li> <li>•Are there implementation guidelines for PPPs and IPPs for new flexible generation assets?</li> </ul>
<b>Key enabler 3: Availability of (cross-border) transmission capacity</b>	<ul style="list-style-type: none"> <li>•What are the national policy provisions for the transmission subsector?</li> <li>•What is the expected role of the country in the development of regional cross-border power trade?</li> </ul>	<ul style="list-style-type: none"> <li>•What are the provisions of the national transmission investment plan?</li> </ul>	<ul style="list-style-type: none"> <li>•Who is in charge of transmission planning?</li> </ul>	<ul style="list-style-type: none"> <li>•What are the provisions for cross-border exchanges?</li> <li>•Are they aligned with the regional rules for cross-border power trade?</li> </ul>	<ul style="list-style-type: none"> <li>•Who develops the rules for the transmission network?</li> <li>•How are the modalities for grid access set?</li> <li>•Do the modalities specify how RE generators?</li> </ul>

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