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for Sustainable Energy

TOWARDS AN AFRICAN SINGLE ELECTRICITY MARKET-AFSEM

Policy paper and Roadmap 2040



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ABBREVIATIONS

AfCFTA	African Continental Free Trade Area
AfDB	African Development Bank
AFREC	African Energy Commission
AFSEM	African Single Electricity Market
AFUR	African Forum for Utility Regulators
APUA	Association of Power Utilities of Africa
AU	African Union
AUC	African Union Commission
AUDA	African Union Development Agency
CAPP	Central Africa Power Pool
Comelec	Comité Maghrébin de l'Electricité
COVID-19	2019 Coronavirus Disease
DIE	Department of Infrastructure and Energy
EAPP	Eastern Africa Power Pool
ECOWAS	Economic Community of West African States
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
KE	Key Expert
NEPAD	New Partnership for Africa's Development
NKE	Non-Key Expert
PIDA	Programme for Infrastructure Development in Africa
REC	Regional Economic Community
SAPP	Southern African Power Pool
SE4ALL	Sustainable Energy for All
STC	Specialised Technical Committee
STSC	Sectorial Technical Sub-Committee
TTIIET	Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism
TAF	Technical Assistance Facility
UN	United Nations
UNECA	United Nations Economic Commission for Africa
USD	United States dollar
WAPP	West African Power Pool

FOREWORD

Launched by the African Union Commission (AUC) in early 2021, the **African Single Electricity Market (AfSEM)** is set to become one of the largest electricity markets in the world, covering all African Union Member States, and a population of more than 1.3 billion.

The AfSEM aims at connecting the African Continent's energy strategies and action plans by harmonising regulatory frameworks and integrating generation, transmission, and distribution master plans. This will allow for the diversification of energy sources supporting energy transition, better trade and investments exchanges, and closing the energy infrastructure gaps between regions and countries.

The present **AfSEM Policy Paper and Roadmap** focuses on:

- concrete benefits including enhanced cost efficiency, increased use of renewable energy technologies, and improved security of electricity supply,
- alignment with the Paris Climate Agreement, the UN Sustainable Development Goals, and the Agreement Establishing the African Continental Free Trade Area (AfCFTA), and
- harmonisation of the electricity markets, which should be achieved at all three levels – national, regional, and continental.

Over 100 energy stakeholders of the African Continent have been involved in the construction of the AfSEM Policy Paper and Roadmap.

The AUC has been coordinating the harmonisation of the African electricity markets, with the strategic objectives to improve access to reliable and sustainable energy, to promote industrialisation, economic development, and job creation.

Since 2015, the European Union's dedicated Technical Assistance Facility for Sustainable Energy (EU TAF) has been supporting the AUC in this endeavour, with technical and financial assistance. The EU TAF technical team presented for validation the current document, the AfSEM Policy Paper and Roadmap, to the AUC and African stakeholders in November 2020. After discussion, it was adopted by the Extraordinary Specialised Technical Committee on Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism (STC-TTIET) on 12 January 2021, and endorsed by the AU Heads of States and Government on 7 February 2021 at the 34th Ordinary Session of the AU Assembly. On 3 June 2021, the AfSEM was launched by the AUC through its Department of Infrastructure and Energy (DIE) and entered into the implementation.

Media advisory for the launch of AfSEM:

<https://au.int/en/newsevents/20210603/launching-african-single-electricity-market>



1. INTRODUCTION

Access to reliable, affordable, and sustainable energy is a universal goal. However, approaches for achieving this goal will differ from continent to continent. Moreover, achieving the goals of the Paris Climate Agreement and the UN Sustainable Development Goals will require more electricity, in particular renewable electricity, for final energy consumption.

Africa accounts for only 5.9% of the world's total energy supply¹. The share of renewables as a part of total energy supply is currently high, there, at 47.4%, mainly because Africa accounts for a third of the globe's solid biofuels supply. Energy in Africa is a scarcer commodity than in the rest of the world. For instance, in many African countries per capita electricity consumption is more than a hundred-fold lower than in the richest countries. Meanwhile, two-thirds of those without access to electricity in the world today live in sub-Saharan Africa.

Electrification

Access to an affordable and reliable electricity supply for households and industry is, internationally-speaking, an energy policy priority. Electrification is strongly related to growing life quality, human development and a cleaner environment. It is even more pronounced with the growing importance of electricity in final energy consumption and technological development. Electrical vehicles and large-scale electricity storage have accelerated this trend. Globally, the share of electricity in final energy consumption is set to grow from 19% in 2018 to 24-31% in 2040².

Electricity is not a heavily-traded good. Certainly, it is much less widely traded than oil, gas, and coal. Of all the gross electricity generated in the world, only around 3% is globally exported across national borders³. Most of this trade is in Europe and has been facilitated by the development of the electricity market in the European Union (EU).

The COVID-19 crisis once again highlights the central role of electricity, and determines what policymakers need to do in order to ensure that power systems remain reliable. Maintaining and building up infrastructure, paying attention to the welfare of skilled personnel, the efficient use of existing infrastructure and cross-border trade are the crucial issues here.

The installed generation capacity in Africa, in 2015, was 165 GW or 3% of global installed capacity, with 80% fossil fuel generation (gas 44%, coal 27%, oil 9%) of total installed capacity⁴. Hydropower plays an important role and stands at 15%. Wind, solar, geothermal and biomass together provide only 5%. The total electricity demand in Africa in 2015 was 613 TWh, with South Africa and Northern Africa making up more than half. Despite the strong growth of installed generation capacity in the last decade, Africa has not caught up with other parts of the world. African capacity remains at 3% of global capacity, and consumed electricity per capita remains low when compared with industrialised countries.

Industrialisation, rising household incomes and climate change mitigation policies will triple electricity demand to 2030 TWh by 2040 and nine-fold to 5331 TWh by 2065⁵. To achieve full access to electricity by 2030, the annual connection rate should be 60 million. Today, 600 million Africans are still without access to electricity.

The expansion of generation capacity should be accompanied by a continuing focus on transmission and distribution systems for reducing power outages. Many African businesses suffer from electricity disruptions. Being connected to the mains is not the same, of course, as having a reliable electricity service. Network losses should also be substantially decreased to below 10%⁶ to increase the economic efficiency of the electricity sector.

¹ International Energy Agency (2017), Total primary energy supply 2017, Paris.

² International Energy Agency (2019), World Energy Outlook 2019, Paris.

³ Oseni and Pollit (2014), Institutional Arrangements for Promotion of Regional Integration of Electricity Markets: International Experience, The World Bank, Policy Research Working Paper 6947.

⁴ Joint Research Centre (2019), Energy Projections for African Countries, Luxembourg.

⁵ Joint Research Centre (2019), Energy Projections for African Countries, Luxembourg.

⁶ International Energy Agency (2019), Africa Energy Outlook, Paris.

Potential of renewables

Solar photovoltaics could be a key source of electricity, as Africa has 40% of global potential solar resources. Africa's estimated renewable power potential is: 10 TW of solar; 350 GW of hydro; 110 GW of wind; and 15 GW of geothermal⁷. This potential should be used. Already by 2030, the share of renewable electricity in the generation mix is expected to grow to 50%, with wind and hydro capacities reaching 100 GW and solar capacity over 90 GW⁸.

The strong growth of variable renewable energy sources in the generation mix will increase the demand for system flexibility, both in terms of supply and demand, and require adding energy storage. The expansion of generation capacity should be accompanied by a strong focus on transmission and distribution assets, their extension, densification, and management.

Needs of investments

To keep pace with growing demand, investment in the electricity sector needs to be considerably increased. Some USD 5.9 trillion of capital investment will be required before 2065⁹. In sub-Saharan Africa alone, investment needs to average at least USD 45 billion a year. Half of all investment should be dedicated to the expansion, reinforcement, and maintenance of grids, including mini-grids and cross-border infrastructure.

Today, most electricity sector investments in Africa are underpinned by public funds. Given the financial constraints on electricity utilities and the limited fiscal room for manoeuvre of governments, private sources of finance will be essential for investments in the electricity sector. Four areas are crucial in financing investments in the electricity sector: the better financial performance of electricity utilities; improvements in procurement frameworks; more sustainable business models in the decentralised sector; and the strengthened provision of long-term finance¹⁰.

Cross-border trade

Cross-border electricity trading in Africa has received considerable attention for more than twenty years. The Southern Africa Power Pool (SAPP) was established in the mid-1990s and was followed by the Central, Western and Eastern Africa Power Pools (CAPP, WAPP and EAPP) in 2003-2005. SAPP has the highest installed generation capacity and the most advanced electricity market. However, SAPP generation is dominated by coal. In EAPP, WAPP and Comelec (Northern Africa), gas-based generation is dominant. The smallest installed generation capacity is in CAPP, with hydropower making up the largest part of the generation portfolio.

There is cross-border electricity trade between the countries in Power Pools and between some countries in different Power Pools. Unfortunately, the volume of trade has continued to be low. SAPP is the most liquid electricity market with 3.5% of demand being met through trade¹¹. South Africa exports a significant amount of electricity to neighbouring countries. In 2018, net exports from South Africa were 4.7 TWh, while net exports from Mozambique were 0.5 MWh. In other Power Pools, the volume of trade as a share of demand has been below 1% in most years. There are serious barriers against cross-border electricity trade, critically the lack of power interconnectors. As a result, countries have taken expensive measures to become self-sufficient, with electricity costs in some countries being more than twice the global average.

Africa has the potential to supply all its households and industry with reliable, affordable, and sustainable electricity. However, to do so, it must work together to create a single electricity market and it must use its renewable energy potential.

⁷ African Development Bank Group (2017), *The New Deal on Energy for Africa*, Abidjan.

⁸ International Renewable Energy Agency (2015), *Africa 2030: Roadmap for a Renewable Energy Future*, Abu Dhabi.

⁹ Joint Research Centre (2019), *Energy Projections for African Countries*, Luxembourg.

¹⁰ International Energy Agency (2019), *Africa Energy Outlook*, Paris.

¹¹ World Bank Group (2018), *Power Trade in Africa*, Washington DC.



2. OPPORTUNITIES AND CHALLENGES

The current momentum of African integration

A single electricity market would be an important tool in satisfying Africa's energy challenges. It responds well to the Agreement Establishing the AfCFTA, which created the largest free trade area in the world, connecting 55 countries and 1.3 billion people. AfCFTA's GDP in 2019 is valued at USD 3.4 trillion¹². AfCFTA could provide an anchor for long-term reform and integration, helping to overcome the consequences of the COVID-19 pandemic¹³. Real income gains from the full implementation of AfCFTA could be 7% or nearly USD 450 billion by 2035. By the same year, it has the potential to lift an additional 30 million people out of extreme and another 68 million people out of moderate poverty.

AfCFTA is designed to create a comprehensive African single market for goods and services. It is an important political process with significant long-term economic potential. Intra-African imports as a proportion of total African imports have almost tripled over the past two decades to reach 13%, and there is much room for further dramatic growth. Intra-African trade offers great potential for regional value chains and for boosting growth and development. By 2035, the volume of total exports will grow by almost 29% relative to the business-as-usual scenario, with most of the increase being in African trade. The founding of AfCFTA will increase private sector interest and confidence in the African market.

The objectives of market opening are laid out in the AfCFTA Agreement the negotiation and ratification of which have injected new dynamism into the regional integration process. The preamble to the AfCFTA Agreement identifies eight Regional Economic Communities (RECs) as the "building blocks" of AfCFTA wherein the liberalisation of trade will start. However, not all of them are yet free trade areas with fully liberalised internal trade. Hence, the African Union (AU) should drive and facilitate the integration process as many important prerequisites for the liberalisation of trade have yet to be negotiated and agreed upon.

Electricity demand will be boosted by the liberalisation of trade and this is, indeed, one of the services that AfCFTA intends to liberalise. With the AfCFTA Agreement, a common approach to the electricity sector liberalisation has been agreed. In the next phase of negotiations, a set of rules on investment and competition policy should be prepared. These will play an important role in the functioning of the electricity sector.

The liberalisation of the electricity sector will be beneficial for all African nations, while the worries of particular countries might be best addressed with "special" treatment, for instance, temporary derogations.

The potential of regional electricity markets

The establishment of an African Single Electricity Market (AfSEM) clearly follows the spirit and the letter of AfCFTA. There are potentially significant savings from increased electricity trade over existing interconnections. The integrated operation of Power Pools lowers the need for capacity reserve and enhances system reliability. It also reduces reliance on imported fossil fuels. For instance, full SAPP integration would result in cumulative savings of over USD 42 billion in investment and operating costs for the region by 2040, compared with the business-as-usual scenario in which each country implements its own national power system development plan¹⁴. Moreover, there are, for the period 2020-2030, encouraging prospects for EAPP to potentially gain USD 7.6 billion from integration based on existing and already agreed transmission links¹⁵. Deeper integration, which would require better generation and interconnection plans at the regional level, could increase the benefits to USD 18.6 billion. Furthermore, in the eastern Nile basin region, electricity trading scenarios outperform a scenario that assumes no such trading. They lower, in fact, system costs by 4.5-7.2%, improving energy security and mitigating greenhouse gas (GHG) emissions¹⁶. There are long-term economic benefits to be had through dispatch and trade optimisation over existing and committed interconnections. This is the case even before scaling up renewable energy generation and new cross-border transmission capacity.

¹² World Bank Group (2020), The African Continental Free Trade Area, Washington DC.

¹³ World Bank Group (2020), The African Continental Free Trade Area, Washington DC.

¹⁴ World Bank Group (2019), Southern Africa Power Pool - Program for accelerating transformational energy projects, Washington DC.

¹⁵ Remy, T., Chattopadhyay, D. (2020), Promoting better economics, renewables and CO2 reduction through trade: A case study for the Eastern Africa Power Pool, Energy for Sustainable Development, 57, 81-97.

¹⁶ Mondal, MAH., Ringler, C. (2020), Long-term optimisation of

Access to electricity

The development of efficient regional generation and transmission projects would support the extension of electricity access. The development of an integrated power system would, likewise, facilitate electricity access and considerably increase the speed with which customers are connected. For instance, the recently proposed Tanzania-Zambia interconnector would enable 21,000 new customers to be connected.

Resilience

Deeper integration would provide more efficiency in the reduction of GHG emissions. Tight integration would give the power system a greater ability to reduce the impact of major droughts due to the increased flexibility of a stronger and wider network. Hydropower plays a major role in electricity supply. It currently accounts for 17% of electricity generated in Africa, and this share is set to reach 23% by 2040¹⁷. In some countries, the share of hydropower exceeds 80%. Africa is strongly affected by climate change, which affects water availability and year-to-year variability. One of the best resilience measures is stronger interconnections with neighbouring countries. For instance, the Mozambique-Malawi interconnector will help with increased electricity demand and in providing reliable electricity services. It will also, though, reduce the potential for power crises resulting from droughts affecting the Shire River.

Accelerator for cleaner, greener solutions

Stronger power system integration would help renewable energy sources to be better used. Reaching regional renewable energy targets is more cost-efficient than each country going its own way. A fully renewable power system is technically feasible, economically viable, and the most efficient and most job-rich option for some African regions. Shifting to variable renewable energy sources, using electric vehicles with a growth in electricity demand for cooling would make a substantial shift in grid use. It should also provide for addressing imbalances. The grids need to be “wiser.” Africa could develop a grid that is the most modern in the world.

The development of the AfSEM will provide an important asset in the full realisation of flagship projects like the Grand Inga Hydropower Project.

Today, financing renewable energy projects in Africa is a complex endeavour and involves many different actors, with public investment and development finance institutions being key in enabling these kinds of projects. With projects growing in size and ambition and, with the accompanying liberalisation of electricity markets, renewable energy projects will be increasingly taken to capital markets and will be subject to financialisation. An increased role for financial motives, financial markets, financial institutions, and financial actors is crucial in responding to the rising sustainable energy demand challenge.

Africa’s unique potential renewable energy sources provide an important asset for the production, use and trade of renewable hydrogen, particularly in trade with the EU, Africa’s largest trading partner and investor. An early adoption of hydrogen for various applications across end-use sectors will support the overarching objective of the AU’s Agenda 2063 in transforming the continent into the “global powerhouse of the future.” This would attract additional investment in the electricity sector, helping accelerate access to electricity services across the whole continent. Competitive African industry would, in this scenario, be powered by affordable and sustainable energy.

Competitive electricity prices

The development of the AfSEM would help to create better prices for consumers. Access to other electricity markets allows countries: to reduce the installed generation capacity needed to meet peak demand; to share their reserve capacity; and to better respond to seasonal imbalances. Regional capacity markets can play an important role in coordinating investment plans for a capacity increase at the regional level. Coordinated planning would help to lower capital investments in meeting future demand. In SAPP’s 2025 plan to add 57 GW capacity, USD 48 billion savings are ‘up for grabs’, compared with a national-based approach¹⁸.

¹⁷ International Energy Agency (2020), *Climate Impact on African Hydropower*, Paris.

¹⁸ Energy Sector Management Assistance Programme (2010), *Regional Power Sector Integration*, Washington DC.



Complexity

Integrating power systems is a complex issue. Power systems are very different in size, institutions and characteristics (grid frequency, voltage, grid state, etc.). Integrating power systems demands careful planning and a strategy for bringing systems closer over time and for facilitating deeper integration. The key success factors are: a common legal and regulatory framework; the harmonisation of the operational framework; the creation of an independent Regional Regulator; the creation of a regional electricity market; and increased cross-border transmission capacity. Establishing an efficient regional electricity market requires both “hardware” (transmission grids, generation plants) and “software” (harmonised rules), as well as adequate governance.

Integrating power systems brings big opportunities for development. But its implementation will prove a significant challenge. Achieving the full potential of the AfSEM will depend on putting in place significant electricity policy reforms and on attracting substantial investments. It will be a step-by-step process at the national, regional and continental levels.

3. BASIC PRINCIPLES

Commitment, coordination, sovereignty

The establishment and the operation of AfSEM depend on the political will and commitment of AU Member States. Indeed, a strong commitment to integration is key to success. This includes working together to strengthen electricity supply security, to promote interconnections, to develop electricity markets and to promote renewable energy sources. This does not affect the rights of AU Member States to choose their energy sources or their ability to determine the conditions for exploiting their energy resources. Creating the AfSEM does not diminish the energy sovereignty of AU Member States; it enriches it.

Gender

The development of the AfSEM should also take gender mainstreaming into account. Men and women have different needs and living conditions and circumstances. This includes unequal access to resources. The design and implementation of the AfSEM needs to be able to benefit both. There are already some good examples like the ECOWAS Programme on Gender Mainstreaming in Energy Access. This builds and strengthens capacities for gender mainstreaming in energy policies and projects; supports the development of gender-sensitive policies; promotes knowledge management; creates awareness and advocacy on gender and energy issues; and implements gender-responsive investment and business promotion in sustainable energy development. Gender considerations have been incorporated into institutional frameworks, networking and knowledge sharing, capacity building and clean energy interventions.

Sustainable development

The AfSEM is an efficient tool for achieving the Paris Climate Agreement goals and the UN Sustainable Development Goals. The design of the AfSEM should be firmly based on access to modern electricity services. Besides focusing on the grid-based solutions, the deployment of off-grid technologies, such as mini-grids, should be fully taken into account to speed up providing electricity to all users.

Strategic objective

The AfSEM is a goal and a tool at the same time. It should provide unhampered electricity flows across borders, fostering the conditions for peace, stability and economic growth. At the same time, it needs to facilitate necessary investments in generation, transmission, and distribution. It should also facilitate solutions for current needs while providing a pathway for medium- and long-term strategies by maximising the use of existing infrastructure, giving price signals for new investments, and improving the performance of the electricity sector in each AU Member State.

The creation and functioning of the AfSEM depends on good governance. The AfSEM itself should promote these things further and take into consideration what has already been achieved in the electricity sector as well as the already established institutional structure. It should be a step-by-step process with the full involvement of institutions, with support for the regions with the most challenges.

Electricity markets need to work in the interests of consumers. Reliable electricity services with reasonable and affordable prices ought to be the rule. Since rapid digitalisation and decentralisation provide for new roles for consumers, demand response and new consumer services should be part of the electricity market design.

The AfSEM's strategic objective is to establish well-interconnected and efficient national, regional, and continental electricity markets. The AfSEM's aim must be to create a stable, transparent, and predictable environment for private investment. It should also create the preconditions for the improved performance and operational efficiency of the electricity supply industry. It ought to enhance the use of renewable energy sources and energy efficiency frameworks, too. Its design should take into account the need to accelerate electricity access for all. The design of electricity markets needs to be built around the continuity of electricity service and the avoidance of outages.

Stages

The AfSEM should be developed through a progressive strengthening and integration of the regional electricity markets in which the national electricity markets operate. In the first stage, national systems ought to be physically strengthened internally and interconnected across borders so that bids and offers (volume and price) can be made to neighbouring systems. This requires technical coordination and some degree of harmonisation in security and reliability criteria. In the next stage (shallow-market integration), interconnected national systems would be coordinated. This requires common technical and economic rules and some harmonisation of system operations. In the third stage (deep-market integration), ancillary service markets and capacity markets need to be harmonised. This requires the joint planning of transmission network expansion. From the outset, this process would be supported by continent-level strategies.

Steps taken

The work necessary for creating the AfSEM has already started with the drawing up of the "Harmonised Continental Regulatory Framework in the Electricity Sector." The central feature of electricity sector reforms over recent decades has been the creation of independent national electricity regulatory authorities in many AU Member States. These have been put in place to regulate and oversee the electricity market and to look after consumer interests at the national level. Several Power Pools and one Regional Regulator have been created at the regional level.

The second ordinary session of the STC-TTIIET adopted, in April 2019 in Cairo, the "Guidelines and Monitoring Plan for Continental Transmission Tariff Methodology" for supporting the implementation of the Harmonised Regulatory Framework. The STC-TTIIET requested AUDA-NEPAD to develop the Continental Transmission Network Master Plan based on the Power Pools' strategic plans.

It also asked AFSEC to be member of the steering committee regarding this project, given its mission to promote, through its members and Technical Committee 8 as a mirror committee of IEC, all related to standardisation in the fields of electricity (i.e. development of standards on overall system aspects of electricity supply, which encompasses transmission and distribution networks, in cooperation of with power quality companies, national standard bodies, Regional Regulators, Power Pools, etc.).

The above are important steps in strengthening the regional electricity markets and in creating a continental one.

The STC-TTIIET's Cairo Declaration requests the AUC, together with all relevant pan-African continental and regional institutions, to operationalise the electricity market in Africa. The creation of the AfSEM will take time. Missing electricity infrastructure and insufficient regulatory convergence at the regional and continental levels are the key challenges. The political will of AU Member States and governance mechanism should provide solutions. The opportunities provided by the AfSEM are too important to squander.



4. ONE GRID FOR AFRICA

Unconstrained electricity transmission across the continent

Investment in electricity infrastructure is the key to success. Reliable electricity transmission infrastructure ensures that electricity can be transported across Africa without major physical constraints.

The easy transference of electricity contributes to a more sustainable electricity supply, as renewable energy sources can be more easily integrated into highly interconnected systems and markets. It also ensures the supply of electricity at the lowest possible cost for society and consumers. Examples from other continental markets demonstrate that in many cases investments in cross-border transmission capacity provide substantial savings in generation investments¹⁹. Development of the appropriate transmission infrastructure enhances competition within the electricity sector and, as a result, increases the competitiveness of the sector as a whole. This benefits the wider economy, by enhancing economic growth and employment.

In emergency situations, the infrastructure enables solidarity between neighbouring countries, while ensuring cross-border electricity supplies. Africa needs not just new power lines. The grid should be “smart.” They need to be able to accommodate renewable energy, to be able to support the implementation of the “energy efficiency first” principle and to be able to respond to changing supply-and-demand patterns.

The development of one grid for Africa should continue to be an organic part of the Programme for Infrastructure Development in Africa (PIDA), that provides a vision and strategic framework for the development of regional and continental electricity generation and transmission infrastructure²⁰. At the same time, the nature of electricity flows requires specific attention and measures.

Interconnection targets

The success of the AfSEM demands the interconnection of the national and regional electricity markets and the strengthening of transmission grids. Construction of internal transmission links and interconnectors is of the highest importance in establishing the national, regional, and continental electricity markets. Interconnectors tie two or more national transmission systems and facilitate the extension of national transmission systems to previously unserved or under-served areas.

Today, operational cross-border transmission capacity in Africa is close to 20 GW, with most interconnections in the south and north of Africa²¹. The projects under construction will at least double this capacity. Africa is connected to Europe and Asia. Only two electricity lines with a nominal capacity of 1.4 GW carry electricity between Africa and Europe. Three new projects are planned: two interconnectors between Tunisia and Italy; and one between Libya and Greece (Crete). Egypt is connected with Jordan and a 3 GW interconnection with Saudi Arabia is under construction. Some African countries still have neither sufficient internal transmission grids nor interconnections with their neighbours. This is not acceptable.

To accelerate the process of developing the African grid, new political tools will have to be rolled out. Each Power Pool should establish goals for AU Member State interconnection for the years 2040 and 2050. The interconnection targets needs to be defined as the import capacity over the installed generation capacity in a given AU Member State. The goals for cross-border transmission capacity for Africa for the years 2040 and 2050 should be established based on developments in Power Pools. Interconnections help electricity supply security and promote wholesale market developments.

A well-functioning AfSEM means competitive prices for consumers. AU Member States must minimise differences in their wholesale market prices. If there are strong price differentials, additional cross-border transmission capacity should be considered. For electricity supply security, peak demand would need to be met through domestic generation capacity and through electricity imports. Increasing the nominal transmission capacity of interconnections would, in many cases, be a more cost-efficient option, especially with increasing generation capacity coming from renewable energy sources.

¹⁹ European Network of Transmission System Operators for Electricity (2020), Completing the map. Power System needs in 2030 and 2040, Brussels.

²⁰ Programme for Infrastructure Development in Africa (2020), Projects Dashboard, <https://www.au-pida.org/pida-projects/>

²¹ Joint Research Centre (2019), Energy Projections for African Countries, Luxembourg.

Each new interconnector must be subject to a socio-economic and environmental cost-benefit analysis and will only be implemented if the potential benefits outweigh the costs. Rapid technological development continues to strongly influence the functioning, the nature of and the need for electricity network infrastructure. This creates new opportunities for electricity generation, transmission, distribution, and consumption. A methodological approach to measuring interconnectivity should closely follow these trends. Present and new interconnectors ought to be used efficiently, and all generation capacity should be available to the market.

Transmission network development plans

Each Power Pool should prepare a regional ten-year transmission network development plan, which would be updated every two years. These plans would identify investment gaps, particularly with respect to cross-border transmission capacity. They would build on national investment plans, provide cost-benefit analyses and they would add a top-down approach to bottom-up ones. This process would need greater transparency regarding the entire regional and continental transmission networks. It would be necessary to flesh out how interlinkages between transmission, distribution and mini-grid developments can be best strengthened.

Projects of interest to Africa

In coordination with AUDA-NEPAD, AU Member States and RECs through their specialised institutions should cooperate to nominate and support projects in Africa. Projects ought to: promote the interconnection, interoperability and development of the national, regional and continental electricity networks promoting the AfSEM at all levels; facilitate the development of less favoured regions; enhance the security of electricity supply; and contribute to the achievement of the Paris Climate Agreement goals and UN Sustainable Development Goals.

Projects touching on Africa should benefit from streamlined permission, improved regulatory treatment on the basis of cost-benefit analyses and cost allocation, and increased transparency, which would mean better long-term financing. Access to financial instruments should be provided for those projects which present an overall net social benefit at the regional or continental levels, but where financing by host countries is problematic due to their high impacts on national system tariffs or asymmetric impacts on costs and benefits.

A typical market failure in relation to investments in interconnecting infrastructure relates to investment decisions by an individual country that may be rational for the country on its own, but not for a group of countries taken together. These asymmetric economic impacts can be dealt with through cost-sharing and/or co-financing. Some projects can enhance electricity supply security, but are not properly remunerated by the market. Innovations and new technologies entail first-mover risks.

By working together, AUDA-NEPAD, AU Member States and RECs can find the best approaches for facilitating the implementation of African interest projects. In a longer perspective they can identify the most appropriate electricity infrastructure projects from an African macro-economic perspective.

Engagement with citizens

The active participation and engagement of citizens is essential in building an electricity network for Africa. The establishment of a continent-wide list of African-interest projects should be preceded by inclusive, open and transparent processes at the national, regional and continental levels. It is crucial that civil society representatives, environmental organisations and any interested stakeholder participate in and contribute to the decision-making process. AU Member States will have different strategies for engaging with citizens. Best practices related to communication and public acceptance campaigns should be shared. The Electricity Forum might prove a good place to swap experiences and to discuss major issues related to infrastructure and to the removal of technical and regulatory barriers.

⁴ SASGI South African Smart Grid Initiative Smart Grids, <https://www.sanedi.org.za/SASGI/about.html>

5. COMMON RULES ON THE ORGANISATION AND FUNCTIONING OF THE AFSEM – KEY REQUIREMENTS FOR ACHIEVING A SINGLE ELECTRICITY MARKET

Harmonisation

Interactions between AU Member States on electricity should be subject to well-defined and commonly-agreed rules. The electricity market needs to move from limited coordination to being truly operational and supra-national. The development of the AfSEM requires: the alignment of electricity policies, legislation and regulation at the national level; the establishment and development of Power Pools and Regional Regulators at the regional level; and interconnection and operation of the regional electricity markets at the continental level. Stable and consistent policy frameworks and improved coordination between actors is needed, too.

The main challenges relate to the liberalisation of the wholesale and retail markets (which is linked with the unbundling of transmission and distribution system operators); non-discriminatory access to the grid; the establishment of an independent regulatory framework; the establishment of technical codes; specifications and standards for promoting harmonisation; and the definition and implementation of regional transmission tariffs.

To facilitate the integration and efficiency of the AfSEM, a set of rules and network codes should be agreed upon. These should cover connectivity, operation, and market rules. The rules need to be able to enhance the efficient use of cross-border transmission capacities. Barriers against commercial transactions between different countries (and/or regions) ought to be removed.

Harmonisation between power exchanges, i.e. common Power Pool trading platforms, should be achieved. This requires compatibility in times of gate closures and formats of bids and offers. The electricity market will have to provide a basis for the development of day-ahead, intraday, forward, futures and derivatives markets, something which enables investors and operators to manage risks.

Rules on market operation, system operation and transmission regulation should be perfectly enforced for the smooth operation of the electricity market. A dispute settlement mechanism ought to be established, too.

Regulatory framework

Mechanisms of regulatory oversight should be fair and non-discriminatory. The regulators, i.e. the national electricity regulatory authorities and Regional Regulators, ought to be: transparent in their decision-making; deliver their decisions in a timely way; undertake good levels of stakeholder engagement; and use best-practice techniques of regulation. They would ideally be independent and have the means to ensure non-discriminatory network access; promote competition; and provide incentive regulation of electricity networks. Regulations need to be able to provide market participants with transparent and sufficient market information.

Liberalisation of the markets

The most radical change relates to opening up the electricity markets to competition, firstly in the wholesale and then in the retail market. Customers should be able to choose their supplier. Barriers against entry into the national (and/or regional) electricity markets ought to be reduced.

The opening of wholesale markets should be accompanied by efficient and effective market surveillance and enforcement system. The oversight model would provide data collection and market surveillance at the continental level and investigation and enforcement at the national one. The decentralised framework for cooperation amongst multiple stakeholders would provide for integrity and transparency in the wholesale market and would increase the efficiency of the market. An efficient market outcome sends, of course, sound investment signals. Abusive practices need to be explicitly prohibited. But prohibition should be accompanied by comprehensive monitoring and enforcement powers.

Consumers

The electricity markets need to provide for reliable and affordable energy services for households and industry. Their design should incentivise energy efficiency and investments in renewable energy sources, as well as providing access to new customers. Particular attention should be given to the affordability of electricity for households. Universal service would be the ideal here. The particular role of consumers in demanding response and in installing their own generation (and/or storage) capacity ought also to be promoted.

Non-discriminatory access to the networks

The ultimate goal of the AfSEM is to achieve an increasingly interconnected African electricity market with convergent wholesale electricity prices across the continent. This requires consistent national and regional market rules and specific rules encouraging non-discriminatory access to cross-border transmission capacity.

The AfSEM should be based on: the unbundling of transmission and distribution networks from electricity supply and generation; on providing market access to third parties; and on ensuring competition in the wholesale and retail markets.

Regulation of transmission (and distribution) would provide optimal allocation of network costs with guaranteed costs recovery and clear cost signals to market agents. Access to the network should be open and market-based. It will be necessary to establish an optimal network expansion mechanism with particular attention on the full use of cross-border transmission capacity. Electricity should flow from low to high price areas.

Utilities

It is essential that African electricity utilities are prepared for participation in the electricity market, as they will be the key players in the AfSEM. These utilities should be able to function under market conditions and competitive relations. That brings substantial structural and business operation changes to the electricity utilities. Improvement in accountability, reduction of technical losses and improvements in the efficiency of payment systems are just some of measures that would be needed.

Plan-based investment approach

The creation of the single electricity market in a time when many AU Member States have ambitious national targets for installed generation capacity should be “smart.” Whole power system dynamics need to be considered and avoid being fragmented in a project-focused approach. It should also be accompanied by strong programmes for creating a productive demand for power. Taking a plan-based investment approach in the electricity sector would mean considerable savings. A Continental Master Plan, comprehensively integrating generation, transmission, and demand, is a strategic necessity.

6. INSTITUTIONAL SETUP

Ministerial Council

The Ministerial Council needs to take strategic decisions, issue continental guidelines for AU Member States and RECs on the establishment and functioning of the AfSEM. They need also to adopt procedural acts to ensure that the strategic objectives set out for the AfSEM are attained. To align it with AU governance, its role should be performed by the STC-TTIIET, composed of the Ministers responsible for Transport, Transcontinental and Interregional Infrastructure, Energy and Tourism. The Sectorial Technical Sub-Committee (STSC) on Energy would be best placed to oversee the development of AfSEM.

Oversight Committee

The Oversight Committee of the AfSEM should prepare the work of the Ministerial Council. It would, in that role, discuss strategies, policies and plans related to the AfSEM and propose related decisions to the STSC on Energy of the STC-TTIIET for adoption under AU procedures. It would need representatives of AUC-DIE, AUDA-NEPAD, AFREC, AFSEC, AfDB, UNECA, AFUR, APUA, RECs, Power Pools, and Regional Regulators.



Strategic Planning Coordination Unit

The AfSEM Strategic Planning Coordination Unit should develop strategies, policies and plans relating to the AfSEM and forward them to the Oversight Committee. The Coordination Unit ought to maintain an active repository of Master Plans, Strategies and Policies related to the AfSEM; and to monitor and evaluate the operation of the AfSEM. The annual monitoring and evaluation reports would be submitted to the Oversight Committee. The Coordination Unit's work would, meanwhile, be supported by four working groups (Electricity Infrastructure; Regulation and Market Operation; Investments Coordination; Energy Transition and Climate Mainstreaming). Each of the working groups could usefully be chaired by a respective AU institution. The Coordination Unit should operate inside AUC-DIE.

Electricity Forum

The Electricity Forum needs to serve as the plenary meeting body for stakeholders. It would meet at regular intervals with the participation of representatives from: AUC-DIE, AUDA-NEPAD, AFREC, AFSEC, AfDB, UNECA, AFUR, APUA, RECs' department in charge of energy, Power Pools, Regional Regulators, the national energy policy authorities, the national electricity regulatory authorities, transmission and distribution system operators, the electricity utilities, development partners and consumers. It should be co-chaired by AUC-DIE and the presidency at that time. Its role would be to review progress in meeting objectives and to agree on recommendations for the further development of the AfSEM.

7. NEXT STEPS

The planning and the implementation of the AfSEM should be ambitious and, at the same time, realistic. The political objective is to have the AfSEM fully operational by 2040. Three stages in these processes can be identified. The first is the provision of basic preconditions for moving forward: governance, institutional strengthening and strategic planning. In the second stage regulatory and legal convergence towards the AfSEM needs to be achieved. In the third stage the liberalisation of the wholesale markets would take place. Exact years for accomplishing each stage can only be indicative because a great deal of preparatory work is ongoing.

2020-2025 Preparation, Institutional Strengthening and Governance

A political agreement to create the AfSEM should be followed by the approval of the governing structure by the STC-TTIIET that will play the role of the Ministerial Council of the AfSEM. The first meeting of the Oversight Committee ought to be convened early in 2021. The AfSEM Strategic Planning Coordination Unit should be established under AUC-DIE and its Business Plan and a one-year Work Plan prepared. Operationalisation of the AfSEM strategic planning must be established bringing more coherence between different ongoing activities. The first meeting of the Electricity Forum would ideally take place towards the end of 2021.

According to the Continental Guidelines, AU Member States need to establish an independent national electricity regulatory authority, designate an independent transmission system operator and an independent distribution system operator. They should also prepare the national electricity market action plan.

AU Member States would be well advised to restructure their electricity utilities enabling them to participate in the national, regional, and continental markets.

National ten-year transmission network development plans should be prepared and adopted. These could usefully be revised every two years. To support crucial projects for electricity market developments system of nomination and support for the projects of African interests would be adopted.

2026-2030 Legal and Regulatory Development

All RECs should have Power Pools as their specialised institutions, founded on the basis of inter-governmental and inter-utility memoranda of understanding. Power Pools exist to ensure the regional integration of the power system and to achieve a regional electricity market. All RECs ought also to have Regional Regulators as their specialised institutions, founded on the basis of inter-governmental and inter-regulator memoranda of understanding. Regional Regulators would need the power to regulate the processes undertaken by Power Pools and to facilitate the realisation of the regional electricity market.

It would be crucial for the national electricity market action plans to be aligned at the regional level and for regional electricity action plans to be prepared.

Regional network codes and, likewise, regional ten-year transmission network development plans should be agreed upon. Interconnection targets for each REC should be established. The Electricity Forum takes place at regular intervals.

2031-2040 Market Opening

The liberalisation of the wholesale markets should take place across the continent. All eligible customers would, at that point, be free to purchase electricity from the supplier of their choice. Efficient and effective African wholesale market surveillance and enforcement system would need to be established. An oversight model would provide for data collection and market surveillance at the continental level and investigation and enforcement at the national one.

With the liberalisation of the retail markets special attention must be given over to consumer protection.

The regional electricity market action plans need to be aligned at the continental level and the continental electricity market action plan needs also to be established.

A continental ten-year transmission network development plan and continental interconnection target should be agreed upon as should a continental grid code.

The coupling of the regional electricity markets must be driven forwards.

By 2040, the African Single Electricity Market could be fully functional.

8. CONCLUSIONS

Africa has an enormous growth potential in the electricity sector. The AfSEM is expected to provide an electricity sector policy and regulatory framework and to stimulate investments in the grids by mobilising both public and private financing. Creating national, regional and continental electricity markets and the overarching governance structure at the continental level is a complicated endeavour, but one which would provide many benefits for all participants. The Continental Master Plan for transmission and generation would boost the AfSEM's development. Indeed, the AfSEM could reasonably become the largest continental electricity market in the world by 2040. The necessary steps for achieving this are solid national transmission networks and physical interconnections with sufficient capacity, a strong governance model and institutions, and robust information technology for the operation of transmission systems and electricity markets. The AfSEM offers crucial benefits for African citizens and for economic growth of the continent.

