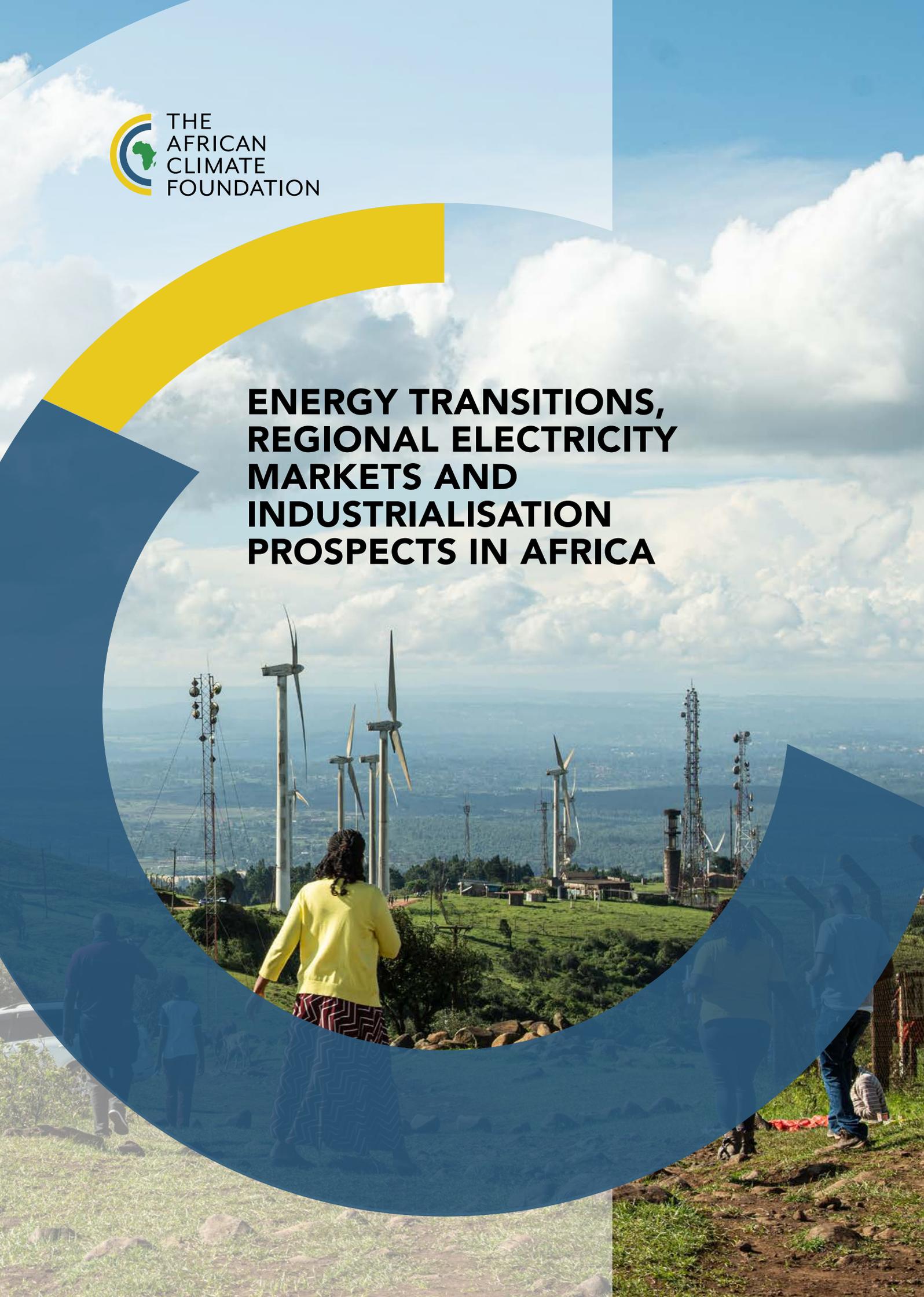


ENERGY TRANSITIONS, REGIONAL ELECTRICITY MARKETS AND INDUSTRIALISATION PROSPECTS IN AFRICA





AFRICA'S ENERGY AND INDUSTRIALISATION NEEDS

African nations have a variety of development needs, but all share a common ambition to industrialise. Expanding access to reliable and affordable electricity sits at the heart of development. However, energy sectors on the continent face a wide range of interlocking challenges, including low access rates, unreliable network infrastructure and high energy costs. Furthermore, energy for productive use is low by international standards, and most industries are constrained by chronic electricity disruptions and technical losses – undermining industrial investments, productivity and economic development more broadly. The continent's electricity shortage is therefore a binding constraint for industrial production and economic expansion.¹ Yet Africa has abundant and underexploited renewable energy resources. The estimated potential of renewable energy capacity could more than satisfy the continent's annual energy demand of 705 terawatt hours.²

The International Energy Agency (IEA) estimates that sub-Saharan African nations³ are expected to record the highest growth in global energy demand, with an average annual rate of 6.5%.⁴ A key question is how to meet Africa's future electricity demand with sustainable, economic and environmentally friendly energy sources that fundamentally shift power systems and create a new development pathway. A vision for 'green industrialisation' is built on the notion that scaling renewable and clean energies will not only minimise negative environmental externalities, but provide economic and society-wide benefits.⁵ African countries have the option to pursue a nationally focused strategy towards energy self-sufficiency, or leverage opportunities presented by regional energy integration. A nationally focused strategy means countries will need to have sufficient generation potential, adequate skills to build and operate projects, and sufficient domestic capital to invest in clean energy. Alternatively, countries would need to be politically stable and attractive to foreign investors.

This policy brief explores the prospects for clean energy industrialisation on the continent, and the opportunities associated with further integrating the region's energy markets. We argue that there is significant potential for African countries to address the energy deficit and industrialise by exploiting untapped renewable energy capacity and capitalising on regional frameworks such as the African Single Electricity Market (AfSEM) and African Continental Free Trade Area (AfCFTA).

ENERGY TRANSITIONS AND INDUSTRIALISATION PROSPECTS

Energy transitions, although largely positioned as a climate action strategy, can be leveraged to increase competitiveness and harness industrial development opportunities. Cleaner, more efficient and affordable energy is fundamental for shaping an inclusive and sustainable development path. The case for advancing the energy transition with renewable technologies is based on energy efficiency and increasing evidence of decreasing costs for renewable energies.⁶ The combined impact of technology advances and global deployment of renewables has resulted in a rapid decline in renewable costs relative to fossil fuels over the last decade.⁷ Cost-effective clean energy solutions could provide massive opportunities for local value creation by catalysing African industries, new industrial value chains and expanding productive capacity.⁸

Despite the global decline in renewable technology costs, country-level modelling has not been sufficiently carried out for most African countries, impacting the accuracy of long-term energy planning and policy decisions. Overcoming some of the challenges associated with the availability of local data, as well as structural and financial constraints, will be key for supporting the transition to clean energy. For example, addressing country-specific risks will require dedicated policy measures to de-risk investments where necessary.

The energy transition and a green industrialisation can be advanced within the context of the AfCFTA, which holds the potential to significantly drive intra-African trade and diversify the continent's economic base.⁹ This includes the potential for energy exports as well as the creation and growth of clean energy trade corridors. The benefits of the free trade area will depend on creating an enabling environment for infrastructure development and policies fostering regional energy cooperation and shared value within the broader framework of Africa's industrialisation agenda. Therefore, aligning industrial growth strategies with the energy transition is pivotal.

The energy transition, although largely positioned as a climate action strategy, can be leveraged to increase competitiveness and harness industrial development opportunities in Africa

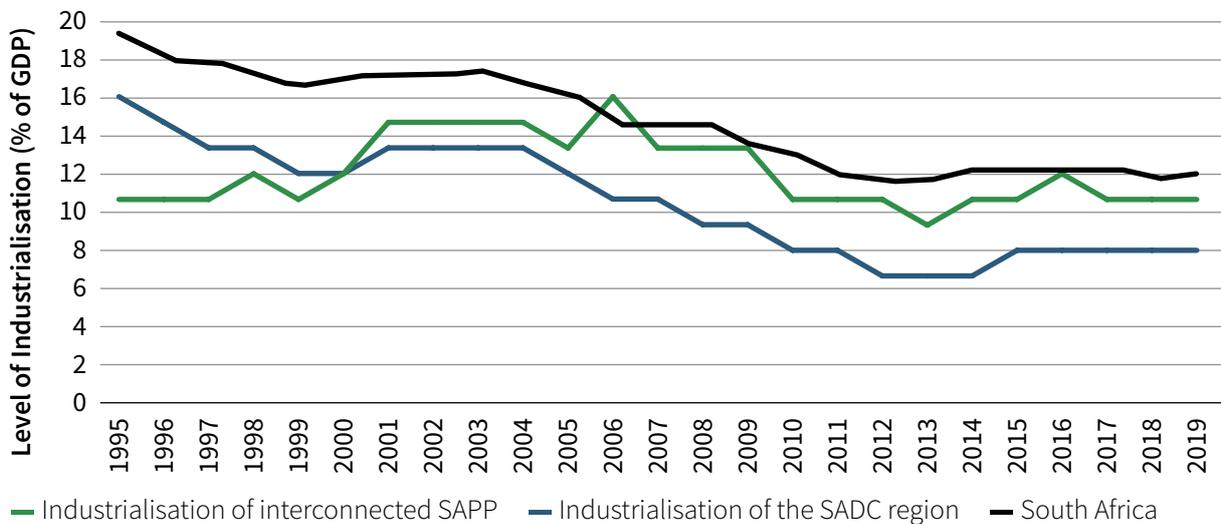


ELECTRICITY MARKET INTEGRATION

Integration of regional power markets is an opportunity for the continent to reorient efforts to accelerate energy transition. The socio-economic opportunities associated with transforming Africa's energy systems require that regional power pools are maximised. The continent's five existing regional power pools,¹⁰ which coordinate the planning and operation of regional power systems among member countries, differ in capacity, governance structures and effectiveness, and rely on strong trust and cooperation between national governments, utilities and independent power producers. Despite efforts to reinforce regional cooperation, power trade amongst countries is still very limited. In reality, regional power pooling on the continent has proved difficult to coordinate for a number of reasons, including inadequate transmission networks and interconnection infrastructure, as well as a lack of harmonised regulatory frameworks. A high level of political commitment is also necessary to successfully implement cross-border trade and infrastructure projects. The record of regional cooperation has therefore been dominated by bilateral (rather than regional) trading agreements that are often focused on meeting national energy security needs.¹¹

The most established power pool – the Southern African Power Pool (SAPP) – operates four competitive electricity markets, trading approximately 17.4% of the member countries' demand in 2019.¹² The SAPP achieved significant progress and growth in generation capacity, expanded transmission networks and installed new interconnectors, particularly in its first decade of operation. However, three countries (Tanzania, Malawi and Angola) remain Non-Operating Members due to not being interconnected on the SAPP grid. Efforts are being made to ensure the integration of these countries into the sub-grid. The interconnected members of the SAPP have also achieved a higher level of industrial growth compared to the regional average in the Southern African Development Community (SADC) region since 2000. Although industrial capacity in the SAPP has declined from 15.9% in 2001 to 13.5% in 2019, this trend has followed but remains above the regional average over the years.¹³ Despite the significant impact South Africa has on the region's industrialisation level, the SAPP's average level of industrialisation has remained above South Africa's since 2006. The SAPP has secured some level of energy demand for interconnected member states – suggesting some correlation between greater energy integration (power pooling) and industrial growth.

Figure 1: Industrialisation levels in the SAPP vs SADC, 1995–2019¹⁴



Source: UNCTADStat Database (2022)

The AfSEM, established in June 2021 to facilitate sustainable development of the African electricity sector, is a targeted intervention of the AfCFTA agreement with a vision to optimise the full potential of the continent’s abundant renewable energy resources and drive electricity access in the most cost-efficient, sustainable, reliable and competitive manner.¹⁵ Its implementation, supported by the Continental Power System Master Plan (CMP) and driven by the African Union Commission (AUC), aims to integrate all five power pools to create a single electricity market.¹⁶ These ambitions, when achieved, should enable African countries to consolidate their collective electricity generation capacity for the benefit of all countries. However, this is still far from being realised and will require extensive investment in the continent’s generation capacity, transmission networks and interconnections. The AfSEM is expected to be fully operational by 2040.¹⁷

AfSEM is an avenue to overcome some of the major bottlenecks faced by individual nations and existing regional power pools. The pooling of resources and increased cross-border power trade provides scope to pursue a regional strategy for a more efficient allocation of energy resources.¹⁸ Regional and continental power pooling will allow countries to dispatch excess capacity in areas rich in renewable energy resources to areas in deficit or high demand.¹⁹ Countries with insufficient domestic generation capacity can therefore secure additional supply of electricity without having to make major capital investments domestically. Aggregating individual power markets also creates a more conducive environment to attract investment across Africa’s energy markets.²⁰ Regional integration further provides a more competitive energy landscape which could create incentives to divert resources from fossil fuels to more productive and competitive energy sources.²¹ Greater cooperation is the most effective mechanism to enhance the continent’s bargaining power.

There is an opportunity to build on existing technical work carried out by the International Renewable Energy Agency’s (IRENA) Africa Clean Energy Corridor (ACEC) framework,²² and ongoing developments under the African Union’s CMP project. By leveraging existing power pools, clean energy corridors could drive the transition to clean energy at scale and support economic diversification and competitiveness. Strengthening regional cooperation could act as a catalyst for countries in the corridor catchment to also develop complementary domestic strategies.

CONCLUSION

Africa is poised to play a critical role in global energy markets, with energy demand expected to grow exponentially over the next two decades. If this demand is met, it will generate growth in productive and income-generating activities. At the same time, unmet demand could undermine economic and social development. Therefore, meeting this demand is crucial and will require that investment choices account for both immediate and long-term energy demands.

The continent's energy-related challenges make it essential to integrate markets and hard infrastructure. Regional and continental power pools provide scope to not only resolve Africa's energy crisis but support a continental industrialisation agenda. For this to be realised, countries must recognise the potential for regional value creation and sufficiently integrate renewable energy policies and industrialisation plans. Moreover, power pool and infrastructure plans need to reflect changing technology and fuel costs, as well as electricity demand growth.²³ This will require African countries to consider the long-term benefits of resource-efficient energy options, developing renewable energy supply chains, and economic integration – all of which should be supported by local content and industrial policies. The AfSEM and AfCFTA provide the framework for these opportunities to be exploited. Under a single continental market, the geographic constraints inherited with the arbitrary nature of post-colonial borders would be abolished, and the benefits of energy integration would be shared across countries.

In summary:

- Energy within an integrated, continental market will not only be an enabler of electricity trade but an enabler of development. The AfCFTA and AfSEM frameworks can deepen regional energy integration and scale renewable-based industrialisation. Other regional and country-level initiatives, such as the ACEC, are important building blocks for the future expansion of low-carbon electrification in Africa.
- The SAPP can offer lessons to scale power trade and create a single market across the region.
- Renewable energy sources have the potential to ensure adequate generation capacity to meet the demand of power pools.
- National and regional low-carbon policies should consider the additional economic and social advantages of renewable energy sources and sufficiently integrate energy programmes with industrialisation plans.
- Significant investments in transmission and distribution infrastructure networks, within and between countries, are necessary for reliable power supply and driving clean energy for industrialisation. This includes developing grid interconnections and enhancing existing infrastructure.
- Although cost effectiveness of renewable energy will be facilitated by greater regional trade and integration, country specific renewable energy cost modelling will need to inform the deployment of renewables.
- Countries need to tap into clean energy financing to maximise the benefits of the energy transition and support industrial development.
- African countries will need to balance the pursuit of meeting short-term national interests over the benefits of scale and scope associated with regional markets. Political economy dynamics of regional cooperation and market integration cannot be ignored.

ENDNOTES

- 1 Blimpo, M. and Cosgrove-Davies, M. (2019). 'Electricity Access in sub-Saharan Africa: Uptake, Reliability and Complementary Factors for Economic Impact', World Bank, <https://openknowledge.worldbank.org/bitstream/handle/10986/31333/9781464813610.pdf>.
- 2 International Energy Agency (IEA). (2019). *African Energy Outlook 2019*, <https://iea.blob.core.windows.net/>.
- 3 This excludes South Africa, which has much higher access rates in the region, although faces major disruptions in electricity supply.
- 4 This is based on IEA's Stated Policies Scenario.
- 5 Altenburg, T. and Assmann, C. (eds). (2017). *Green Industrial Policy. Concept, Policies, Country Experiences*. Geneva, Bonn: UN Environment; German Development Institute, https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green%20Industrial%20Policy_Concept%2C%20Policies%2C%20Country%20Experiences.pdf, p.7.
- 6 Mathews, J. (9 December 2015). 'New: Renewables Can Now Play Important Role in Industrial Development', <https://energypost.eu/new-renewables-can-now-play-important-role-industrial-development/>; Energy Post and IRENA. (2021). *World Energy Transitions Outlook: 1.5 °C Pathway*. Abu Dhabi: International Renewable Energy Agency, p.28.
- 7 IRENA. (2020). *Renewable Power Generation Costs in 2019*. Abu Dhabi: International Renewable Energy Agency, <https://www.irena.org/>. At the level of individual countries, the weighted average of the levelised cost of electricity for utility-scale solar PV declined by between 66% and 85% from 2010 to 2019. Similarly, over the long term, the cost of producing PV solar panels reduced from approximately US\$47.7 per Watt (W) in 1977 to US\$0.38 per W in 2019. For more, see OWD. (2022). *Solar PV Module Prices: Global Average Price of Solar PV Modules, Measured in 2019 US\$ per Watt*, on the Our World in Data website: <https://ourworldindata.org/>.
- 8 Kraemer, A., Carin, B., Gruenig, M., Blumenschein, F., Flores, R. et al. (21 March 2017). 'Green Shift to Sustainability: Co-Benefits & Impacts of Energy Transformation on Resource Industries, Trade, Growth, and Taxes', G20 Insights, https://www.g20-insights.org/wp-content/uploads/2017/04/G20_T20Insight_Resources_170424-1.pdf, p.7.
- 9 Mkhabela, V. (20 April 2021). 'African Continental Free Trade Area Needs an Action Plan to advance transformative industrialisation', *Daily Maverick*, <https://www.dailymaverick.co.za/opinionista/2021-04-20-african-continental-free-trade-area-needs-an-action-plan-to-advance-transformative-industrialisation/>.
- 10 The five power pools are: Eastern Africa Power Pool (EAPP), Central African Power Pool (CAPP), Southern African Power Pool (SAPP), West African Power Pool (WAPP) and Maghreb Electricity Committee (Comité Maghrébin de l'Electricité, or COMELEC).
- 11 Medinilla, A., Buyiers, B. and Karaki, K. (2019). 'African Power Pools: Regional Energy, National Power', *Political Economy Dynamics of Regional Organisations in Africa (PEDRO)*, Discussion Paper No. 244, p.3.
- 12 International Energy Agency (IEA). (2019). *African Energy Outlook 2019*. Paris: IEA.
- 13 UNCTAD. (2022). UNCTADStat Database. Geneva: United Nations Conference on Trade and Development, <https://unctadstat.unctad.org/>.
- 14 Industrialisation is measured as manufacturing value-added as a share of gross domestic product (GDP).
- 15 African Union. (2021). 'African Union Launches World's Largest Single Electricity Market (AfSEM)'. Press Release, June 2021, Addis Ababa, <https://au.int/en/pressreleases/20210604/african-union-launches-worlds-largest-single-electricity-market-afsem>.
- 16 IRENA website: [//irena.org/energytransition/Energy-Planning-Support/African-Continental-Power-Systems-Master-Plan](https://irena.org/energytransition/Energy-Planning-Support/African-Continental-Power-Systems-Master-Plan).
- 17 Africa-EU Energy Partnership. (2021). African Electricity Single Market (AfSEM) launched. <https://africa-eu-energy-partnership.org/african-single-electricity-market-afsem-launched/>
- 18 International Energy Agency (IEA). (2019). *Africa Energy Outlook 2019*. Paris: IEA, p.61.
- 19 ESI Africa. (2020). 'The Benefits of Cross-Border Renewable Energy Trading', <https://www.esi-africa.com/industry-sectors/transmission-and-distribution/the-benefits-of-cross-border-renewable-energy-trading/>.
- 20 Papaefstratiou, D. (2019). 'What the AfCFTA Means for the Energy Sector', *Mining Review Africa*, <https://www.miningreview.com/energy/african-continental-free-trade-area-energy-sector/>; and Energy Capital & Power. (2020). 'Here's to a Modern Africa of Continental Free Trade and Energy Access', <https://energycapitalpower.com/heres-to-a-modern-africa-of-continental-free-trade-and-energy-access>.
- 21 Adeniran, A., Onyekwena, C., Osakwe, S. and Iheonu, C. (2021). 'How Can the AfCFTA Improve Energy Efficiency and Access in Africa?', *International Institute for Sustainable Development (IISD)*, <https://sdg.iisd.org/commentary/guest-articles/how-can-the-afcfta-improve-energy-efficiency-and-access-in-africa/>, p.8.
- 22 IRENA website: <https://www.irena.org/cleanenergycorridors>.
- 23 International Energy Agency (IEA). (2020). *Electricity Market Report*, <https://iea.blob.core.windows.net/assets/660c2410-218c-4145-9348-c782e185dcd/ElectricityMarketReport-July2022.pdf>, p.54.

ABOUT THE AFRICAN CLIMATE FOUNDATION (ACF)

The African Climate Foundation, established in 2020, is the first African-led and -based strategic grant-maker and think-tank working at the nexus of climate change and development in Africa.

ABOUT THIS SERIES

The ACF commissioned a series of expert briefs undertaken for its Energy Access and Transitions Programme, focused on specialised topics on the political economy of Africa's power sector transformation, and the opportunities and challenges for scaling renewable-based electrification.

ABOUT THE AUTHORS

Siyaduma Biniza is an economist specialising in applied development economics. His work focuses on international finance, public policy, the political economy of development, and regional integration in Africa. Siya has served in a variety of positions at the National Treasury of South Africa and on the Board of the Independent Development Trust. He is currently the Director of PESA and Ubuntunomics.

Maria Nkhonjera is part of the ACF's Energy Access and Transitions team. She is an economist with experience in evidence-based research in East and Southern African markets. Her core areas of work have included industrial development, regional integration and inclusive finance.

ABBREVIATIONS AND ACRONYMS

ACEC	Africa Clean Energy Corridor
ACF	African Climate Foundation
AfCFTA	African Continental Free Trade Area
AfSEM	African Single Electricity Market
AU	African Union
CMP	Continental Power System Master Plan
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
SAPP	Southern African Power Pool
SADC	Southern African Development Community



FOLLOW US ON:



WWW.AFRICANCLIMATEFOUNDATION.ORG

The opinions expressed in this paper are those of the author. They do not purport to reflect the opinions or views of the ACF.