UNIVERSITY OF CAPE TOWN

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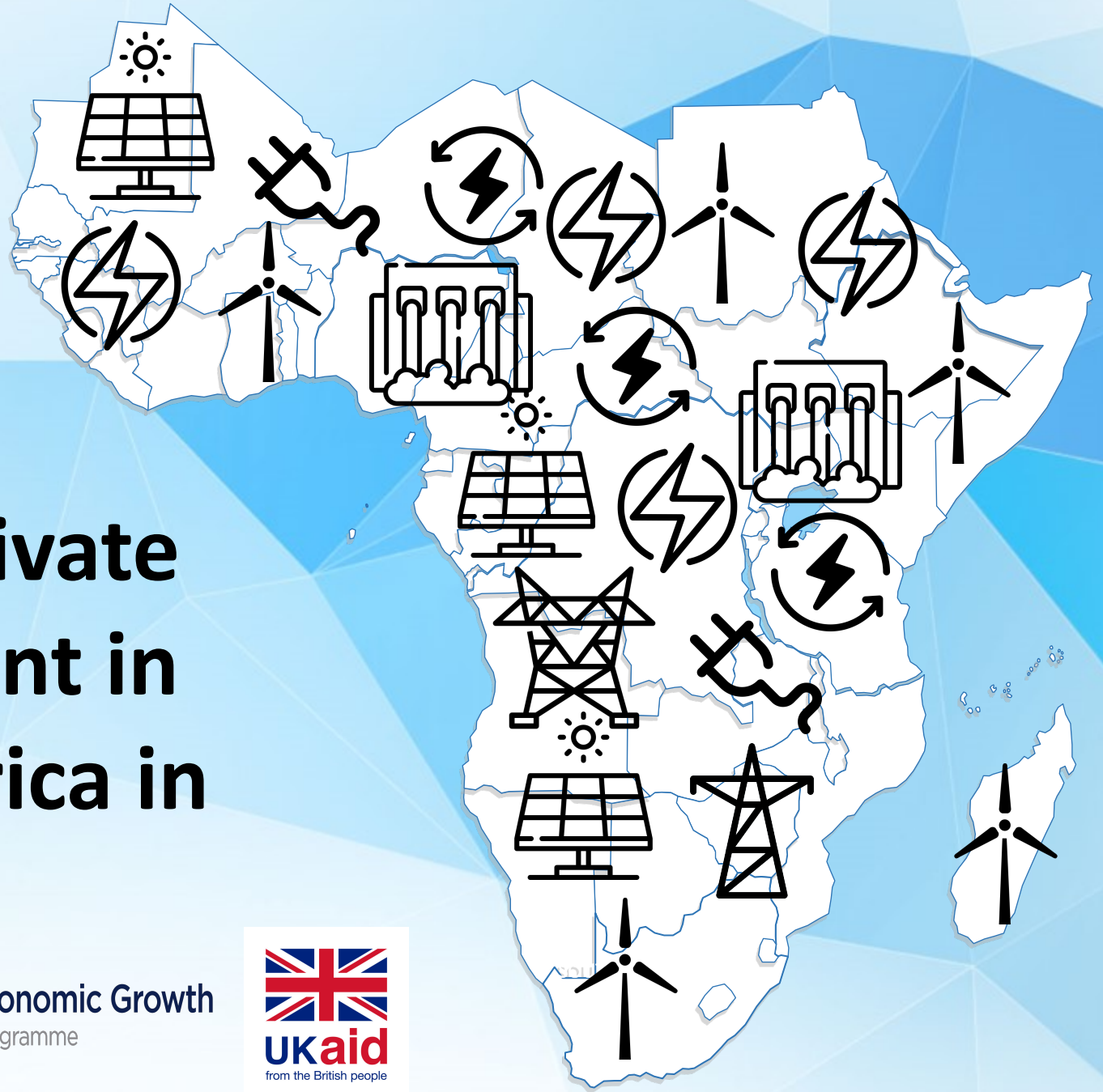
POWER FUTURES LAB



# Prospects for Private Power Investment in Sub-Saharan Africa in the new decade

February 2020

Energy and Economic Growth
Applied Research Programme

UKaid
from the British people

# Electricity access remains a challenge in SSA

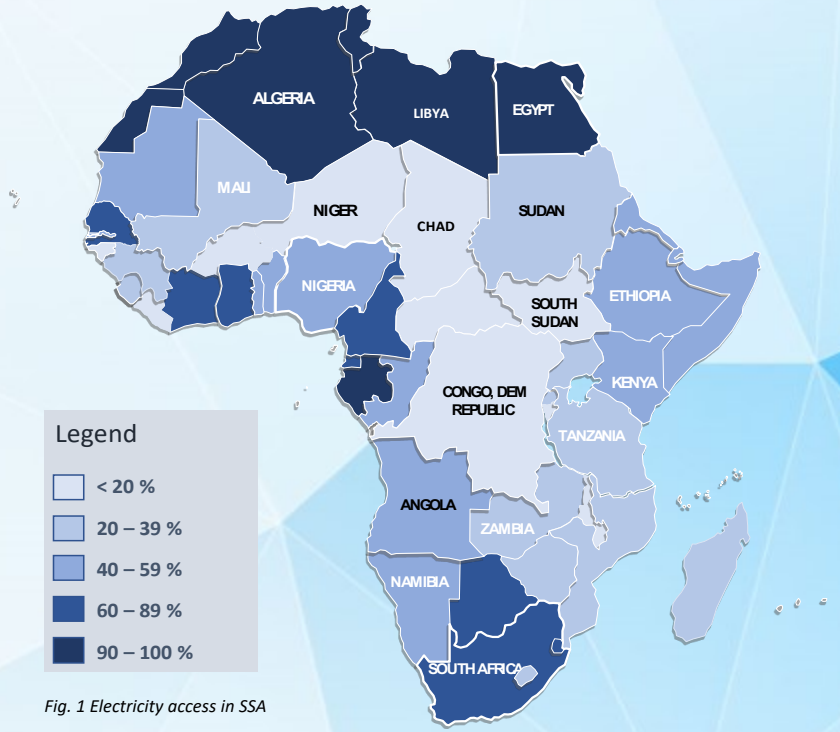



*Fig. 1 Electricity access in SSA*

More than half a billion people in Africa lack access to affordable and reliable energy, which impedes economic, social and human development in the continent (see Fig. 1). Sub-Saharan Africa (SSA) in particular is the world region with the highest prevalence of extreme poverty, which unsurprisingly coincides with its low electrification rate. Per capita electricity consumption in the region sits at about 490 kWh per person each year – which is the lowest by region in the world. The installed generation capacity in the region stands at a meagre 120 GW. To put this in perspective , Italy – a single nation in Europe – has a higher installed generation capacity (130 GW) than the entire region. The direness of the situation is also evident in the spread of power. The biggest chunk of the region's installed generation capacity (about 50 GW) is found in a single nation – South Africa – with the remaining distributed amongst the other nations in the region (see Fig. 1).

This is not to say that the installed generation capacity growth in the region has been stagnant (see Fig. 2). Indeed, more generation capacity has been injected into the region's power sector in the last decade than any other comparable period. However, with the region accounting for one of the highest population growth rates in the world, it is apparent that power generation has not scaled in tandem with demand. Independent Power Producers (IPPs), developed, financed, built, owned and operated by the private sector; and Chinese investments, are now the fastest growing sources of investment in the region's power sector (see Fig. 3). Remarkably, the share of greenfield utility-scale IPPs in total installed power generation capacity in the region is gradually ramping up (see Fig. 4).

# Some recent trends in SSA's power sector

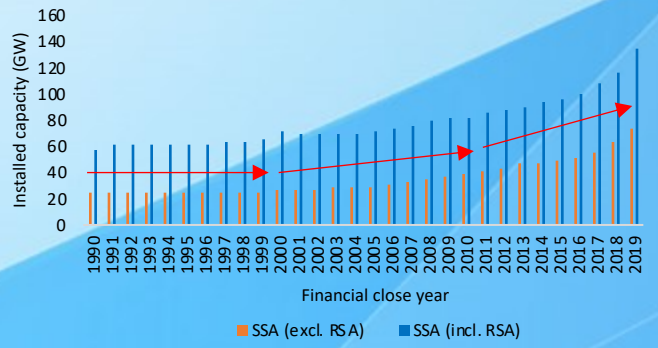



*Fig. 2 Installed power generation capacity in SSA*

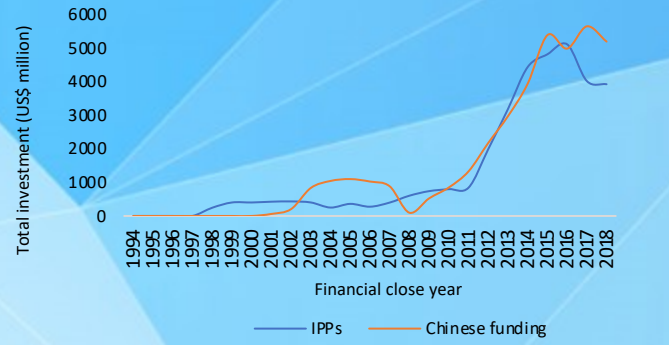



*Fig. 3 IPPs & Chinese investment in SSA's power sector*


*Fig. 4 Share of greenfield IPPs in total installed power generation capacity in SSA*

We have tracked greenfield utility-scale (>5MW) IPPs and Chinese investments in the region over the last decade. The last stock-taking was undertaken in 2018, where we along with World Bank's IFC reflected on the trends around these investment sources in the last 20 years. This short note, therefore, serves as an update on the recent trends in the context of IPPs in the region's power sector. This note also aims to showcase some of the opportunities and challenges posed to the region's power sector in the new decade.

A lot has happened in the last two years. Overall, the signs are encouraging, and we can look towards the future of the region's power sector with cautious optimism.

- Most of the newly added IPPs are now renewable-energy (RE) based. Solar PV in particular is dominating the energy mix of new-build IPPs. This could be attributed to the fact that the technology is proven, mature, cheap and quickly scalable.
- DFIs are increasingly supporting pipeline renewable-energy based IPPs.
- Structured procurement programs (Feed-in-Tariffs and auctions) are becoming the de facto mechanism for procuring electricity in the region.
- Prices for renewable energy are dramatically falling, underpinned by timely, well-coordinated, DFI/multilateral -supported auction programs. In most cases, the prices realized in these programs are much lower than the average tariffs in the respective nations.
- Community engagement & participation and local content considerations are becoming key factors for successful development of IPPs in the region.
- Investment in thermal-based IPP is gradually becoming scarcer in the region.
- Investment in the off-grid sector is seeing increased activity, as DFIs and utility-scale developers are starting to focus some attention on embedded/distributed forms of generation.
- The risk of oversupply is becoming a challenge in some nations in SSA, which reiterates the pivotal role of power sector planning across all sectors of the electricity value chain.
- In a couple of nations (SA & Ghana), the single bulk buyer is considering downwardly revising the tariffs of operating IPPs. This underscores the fact that the absolute goal for power markets in the region should be a fully competitive and restructured market.

# IPP investment in Sub-Saharan Africa

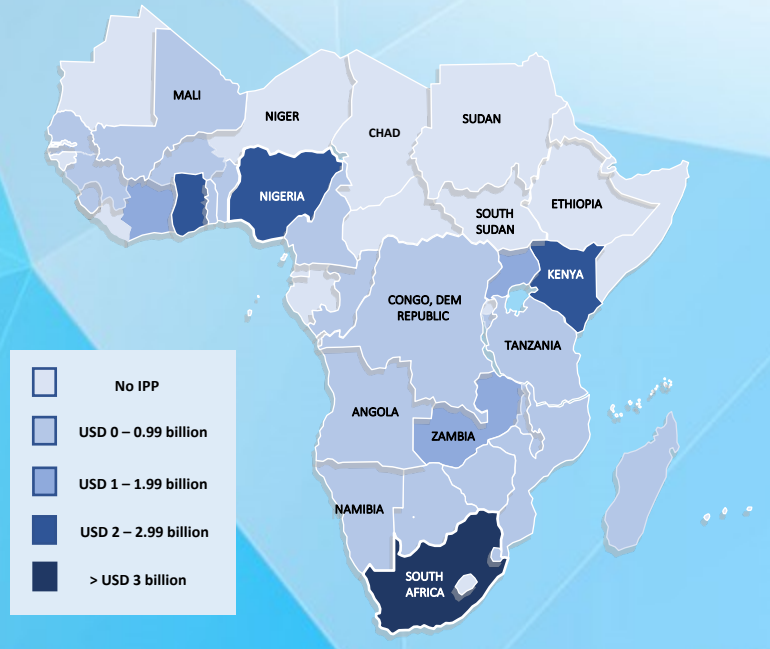



*Fig. 5 IPPs investment in SSA*

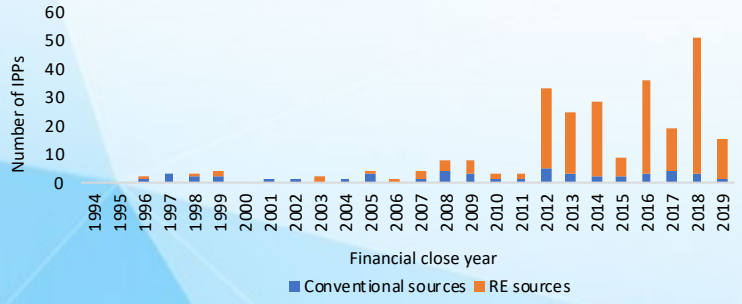



*Fig. 6 Number of IPPs in SSA (Conventional sources vs RE sources)*

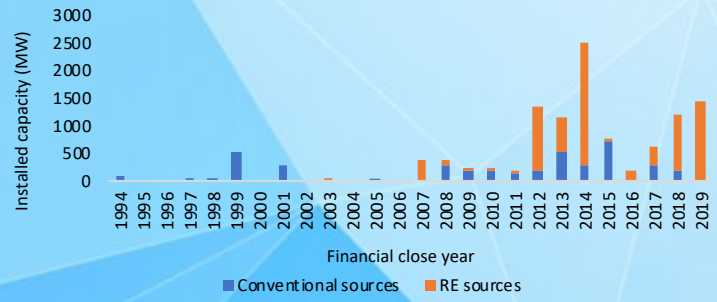



*Fig. 7 Installed capacity of IPPs in SSA (Conventional sources vs RE sources)*

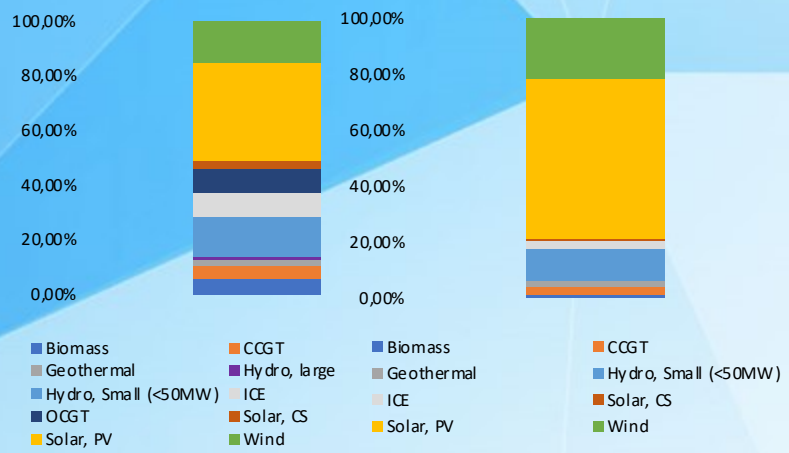



*Fig. 8 Share of IPPs investment (number of projects) by technology in SSA (a) before 2018 (b) after 2018*


*Fig. 9 DFIs contributions to IPPs in SSA (Conventional sources vs RE sources)*

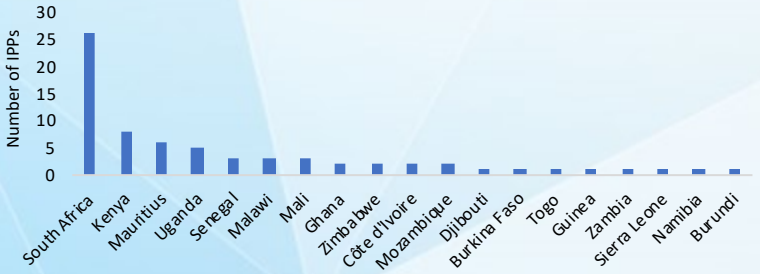



*Fig. 10 Number of new IPPs in SSA, since 2018*

IPPs are spreading across SSA, but large investments are still concentrated in a few countries (see Fig. 5). Overall, more than 280 IPPs have reached financial close (operating or under construction) to date, representing about 20 GW installed capacity and about US$41 billion total investment. Pre-2018, thermal-based IPPs (OCGT, CCGT, ICE, etc.) represented about a quarter of IPPs by technology and were responsible for injecting the most installed capacity (about 9 GW) into the region, compared to RE-based technologies (including South Africa) whose capacity sat at about 6 GW (see Fig. 6, 7 & 8). However, the pendulum is swinging towards RE-based technologies. Since 2018, 70 greenfield utility-scale IPPs (i.e. about a quarter of IPPs recorded in the region) from 19 countries have reached financial close. More than 94% of these IPPs are RE-based (mostly solar PV) (see Fig. 6, 7 & 8). These RE-based IPPs also account for about 87% of the total installed capacity within this period.

These new trends could be attributed to the following:

- DFIs and Multilaterals are increasingly supporting pipeline renewable energy-based IPPs in the form of grants and development loans.
- DFIs (e.g. FMO, IFC, Proparco, EAIF, OPIC, AfDB, etc.), who have contributed about a fifth (~ $8 billion) of the capital mobilized for development of IPPs are now significantly investing in renewable energy-based IPPs (see Fig. 9).
- DFI/multilateral-coordinated renewable energy procurement programs are also resulting in timely low-cost new-build IPPs.

Post-2018 saw a couple of countries – Burkina Faso, Burundi, Djibouti, Malawi and Mali – realize their first utility-scale IPP. Again, the number of projects were concentrated in a few countries – South Africa, Kenya, and Mauritius (see Fig. 10). Interestingly, almost all (39 out of 40) of the IPPs that reached financial close in these three countries within this period were procured via a structured procurement program. 26 IPPs in South Africa reached financial close in 2018. Although these projects faced material hurdles before they had their PPAs signed, they swiftly reached financial close once they got the eventual go-ahead. Currently, all the projects are at least at the construction stage, many of which are expected to come online before the end of 2020. Already, three IPPs – Dyason I, Dyason II and Sirius I, all developed by Norwegian-based Scatec Solar - have been connected to the grid and are now operational.

Most of the IPPs that reached financial close in Kenya post-2018 were contracted under the nation's Renewable Energy Feed in Tariff (REFiT) program. Even though the prices (around US$c 8/kWh for solar PV) realized here were quite expensive compared to those recently achieved via auctions in the region, the volume of capacity additions further indicates the potency of structured programs in realizing quick low-cost new-build IPPs. Essentially, these programs induces more investor confidence in the sector which is always evident in the projects' lead time. Mauritius' case is not any different, as the 6 solar PV IPPs that reached financial close between 2018 and 2019, were all competitively procured in 2016 at a tariff of US$c 6.2/kWh.

# Procurement trends in Sub-Saharan Africa

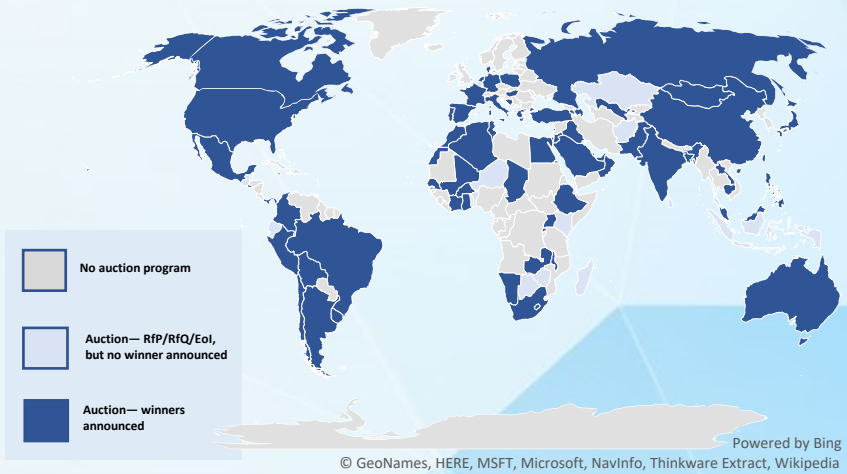



*Fig. 11 Penetration of RE auction programs across the globe*

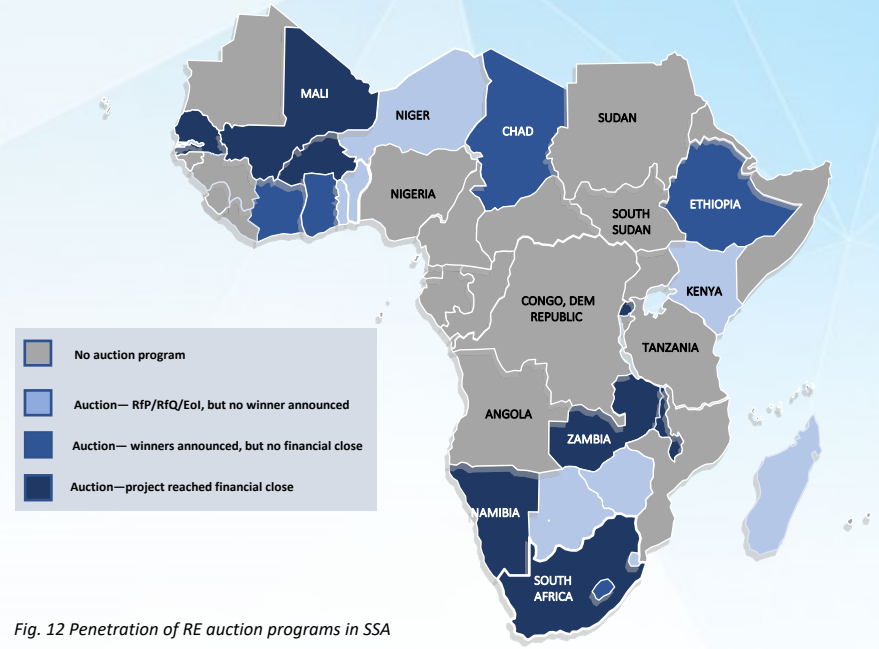



*Fig. 12 Penetration of RE auction programs in SSA*

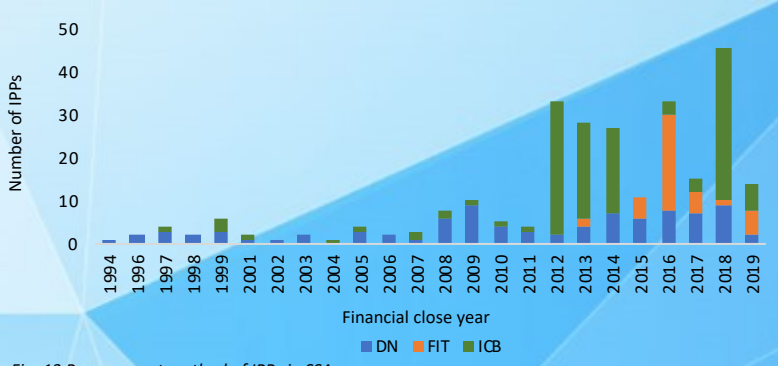



*Fig. 13 Procurement method of IPPs in SSA*

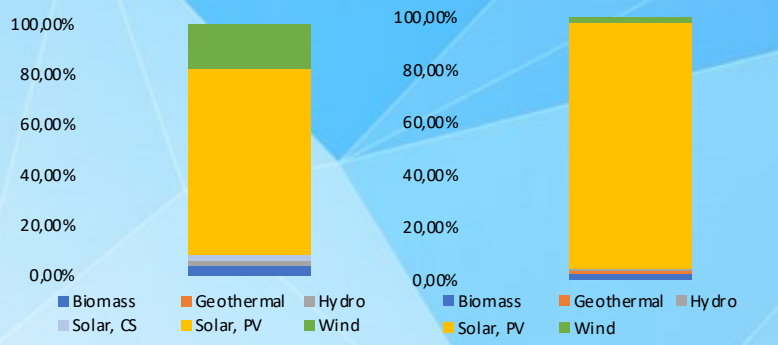



*Fig. 14 Share of RE IPPs by technology procured via auctions in SSA (a) including RSA (b) excluding RSA*

N.B: Hydropower IPPs that are less than 50MW (run-of-river) are considered as RE-based IPPs

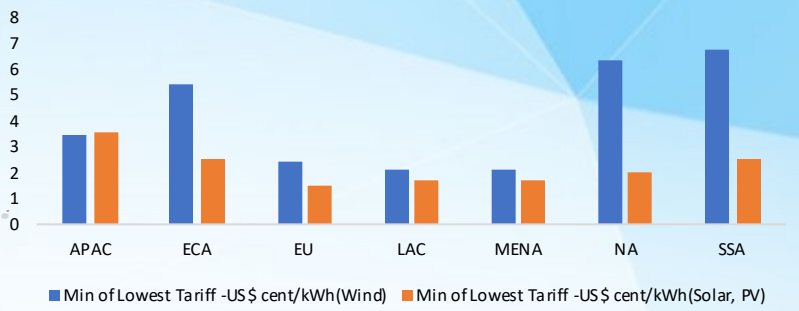



*Fig. 15 Lowest tariff offered for Wind and Solar PV by region*

With prices dramatically falling for solar PV and wind, auctions are set to dominate future power procurements globally (see Fig. 11). Most countries across the globe are transitioning from a renewable energy Feed-in-Tariff or Feed-in-Premium scheme to fully competitive tenders. Presently, a renewable energy auction program is at least at a RfP/RfQ or EoI stage in 96 out of the 195 countries worldwide. SSA is not lagging in this regard, as auctions are rapidly spreading across the region (see Fig. 11, 12 & 13). A renewable energy auction program is at least at a RfP/RfQ or EoI stage in 29 nations in the region. Of this, 193 IPPs (including 111 from South Africa) have at least been awarded for development, representing about 9 GW of installed capacity. More than 35 IPPs are also currently at a RfP/RfQ stage, and no less than 6 IPPs are anticipated to be competitively procured before the end of 2020.

Although, solar PV and wind seems to dominate the energy mix of RE-based IPPs that have been competitively procured in the region (see Fig. 14a); excluding South Africa, the picture is different (see Fig. 14b). Thus, it is evident that while solar PV has continued to gain traction in the region, other renewable technologies are developing at a snail's pace. Solar PV development in the region has significantly benefitted from DFI/ multilateral-supported auction programs. These supports have been packaged in different forms, such as technical assistance, debt finance mobilization, payment guarantees, etc. These supports have effectively reduced the investment risks faced by IPPs. As a result, prices realised for solar PV in the region are now globally competitive (see Fig. 15). Since 2018, Solar PV IPPs procured under DFI/multilateral-supported auction programs have three times broken the region's solar PV tariff record. In 2018, the Kahone plant in Senegal was awarded at a price of US$c 4.27/kWh. In 2019 six projects were awarded in Zambia at prices ranging from US$3.99 – 4.80/kWh, while the Gad and Dicheto Solar PV plants in Ethiopia were awarded at a regional record-breaking price of US$c 2.5/kWh.

Amongst the different support programs from DFIs and multilaterals, the IFC-managed Scaling Solar program seems the most ambitious. The Scaling Solar program was designed by the World Bank Group to enable competitive and transparent procurement of utility-scale solar PV projects in developing countries. It is present in Zambia, Senegal, Madagascar, Ethiopia, Togo and Cote d'Ivoire; and aims to diffuse across the rest of the region. Togo (July 2019) and Cote d'Ivoire (December 2019) are the latest entrants to the program. Two PV plants – Touba and Laboa – with a combined capacity of 60 MW in the northeast of Cote d'Ivoire are expected to be procured in 2020. In the same vein, a request for proposal has been issued with respect to two solar parks – Kpalassi and Salimdè – with a combined capacity of 90 MW in Togo. These projects are envisaged to be developed within the next two years. Lastly, Angola has also recently expressed its interest in joining the program.

# Other notable recent trends

***Case for community engagement and local participation***

Awareness of the importance of community involvement and engagement, and local content or ownership considerations for the sustainability of IPP investments in the region is becoming widespread. Already, most of the competitive procurement processes in the region have incorporated socio-economic development contributions, local content or local shareholding, e.g. South Africa's REIPPPs, NamPower Hardap Solar PV, etc. DFIs are also increasingly providing development grants to early-stage IPPs with high social and welfare impacts. As an example, the 7.8 MW grid-connected run-of-river Mutunguru hydropower plant currently under development in Kenya secured a US$992,000 grant from the AfDB-managed Sustainable Energy Fund for Africa (SEFA) in 2017. This grant is presently supporting the completion of a detailed environmental and social impact assessment on the proposed facility. The AfDB considered this project a very high impact venture because part of the project is owned by a Community Based Organization that represents each household of the Mutunguru community. The Kinangop wind farm in the same nation – Kenya – is an important cautionary tale. This project reached financial close in 2014 but was unable to proceed to construction thereafter. In 2016, the SPV announced that the project will be shelved because of civil disturbances and protests in the community.

***Case for off-grid development***

While utility-scale IPPs are crucial in ensuring electricity adequacy in the region, bottom-up development approaches – e.g. mini-grid and off-grid systems - must be pursued simultaneously to ramp up electricity access. This is as a result of the cost constraints in developing transmission and distribution networks in highly dispersed settlements, typical of many nations in the region. Fortunately, investment in the off-grid sector is seeing increased activities, as multilaterals/DFIs and utility-scale IPPs are gradually becoming interested in distributed generation options. Some recent initiatives include an AfDB-managed SEFA grant for the development of green mini-grids in Niger and an AfDB-sponsored off-grid energy access fund of about US$95 million (US$59 million equity capital and US$36 million debt contribution) that reached financial close in February 2020. Likewise, in December 2019, Shell Foundation and FMO launched the US$120 million Energy Entrepreneurs Growth Fund (EEGF). The fund is expected to provide long-term investment holding, flexible capital as well as technical assistance to the off-grid sector in the region. As off-grid development gains traction in the region, it is important that connection guidelines and regulations are strictly maintained; otherwise, widespread adoption of distributed generation could result in future synchronisation challenges for transmission system providers.

***Case for power sector planning***

For improved performance of a power sector, all aspects of the electricity value chain must be well-coordinated and planned out. Generation expansion planning, for instance, must be undertaken in tandem with transmission & distribution expansion and in line with forecasted demand. Already, some countries suffer from excess contracted generation capacity. For example, in 2016, as a result of an estimated increase in demand, the Ghanaian government quickly negotiated PPAs with IPPs. The reality is that demand has plateaued due to slow economic growth and an increase in tariff. Because of poor forward planning, Ghana now pays for capacity that it is currently unable to utilize. In East Africa, investment in generation has been motivated by the Eastern Africa Power Pool (EAPP) single power market interconnection. Interconnection infrastructure has however not developed along with generation. It is thus estimated that in the next four years, Ethiopia, Kenya, Tanzania, Uganda and Rwanda will likely also sit on generation capacity that they cannot use. Kenya and Uganda presently encounters the challenge of excess generation supply, which underlines the importance of power sector planning across the electricity value chain.

***Case for restructuring reforms***

The case for restructuring reforms ties in with the need for power sector planning. In South Africa, the state-owned utility Eskom is planning on renegotiating the PPAs of operating IPPs that were signed in the first two rounds of the REIPPP. This could have a detrimental effect on investment and underscores the need for timely restructuring reforms in the entire region. Although restructuring reform is not a *silver bullet* for an improved power sector, it will certainly eliminate the inevitable *conflict of interests* that is inherent in a vertically integrated monopoly.

# Conclusion

Sub-Saharan Africa (SSA) faces a significant hurdle of achieving industrialization while conforming with the realities of global environmental imperatives. Fortunately, generation capacity expansion and electrification scaling activities in the region coincides with the period where there are global financial and regulatory incentives towards the development of renewable energy. SSA has a golden opportunity to leapfrog the rest of the industrialized world (most of whose economies are underpinned by fossil fuel) as a global green economy leader. The immense land and renewable energy resources in the region also gives her a competitive advantage over the rest of the world. In Kenya, renewable energy-based power plants already constitute more than 90% of the energy mix in the nation. The situation is similar in Uganda and Ethiopia, were renewable energy accounts for more than three-quarters of the installed generation capacity.

In the new decade, IPPs – currently one of the fastest growing sources of investment in the region's power sector - will play a leading role in greening the region's economy. They will ease the burden of financing large power projects on the public sector. Over time, they will also reduce the average cost of electricity in the region. Experiences with IPPs in the region indicate that compared to other procurement mechanisms, competitive procurement (especially DFIs/multilaterals-supported) have resulted in quick addition of new-build IPPs at low prices. Therefore, in the new decade, timely, predictive, well-coordinated (and perhaps donor-backed for infant and frontier markets) auctions should be the *go-to* method for contracting IPPs in the region. The role of DFIs in providing technical assistance and mobilizing capital for IPPs in SSA will remain important, especially in frontier markets with little private sector experience. The current limitations in energy storage systems imply that investment in highly efficient and low carbon-emitting gas peaking power plants will remain critical. Gas peaking power plants will help inject time-independent base power to enhance the robustness, stability and resilience of the region's grid, which is expected to be highly renewable in the new decade.

To achieve SSA's untapped energy potential, host governments must create an enabling environment that attracts private sector investment in the sector. Universal reforms in the region must be fully pursued and properly implemented to alter the incentives for utilities to be more reliable, operationally efficient and financially sustainable. Generation expansion must be planned in alignment with the sector's networks and forecasted demand; and must be translated into well-coordinated and implemented competitive procurement programs. Decentralized retail-scale IPPs should also be concurrently developed, along with utility-scale grid-connected IPPs. Guidelines that govern the technical, commercial and legal aspects of distributed generators should be clearly spelled out and must be in accordance with the larger network to avoid synchronization and system balancing issues in the future. Lastly, the development of the local industry should remain central to IPP development in the region.

# About Power Futures Lab

Power Futures Lab strives to be a leading centre of excellence and expertise for Africa and other emerging and developing economies. Based at the University of Cape Town's Graduate School of Business, Power Futures Lab aims at enhancing understanding and building capacity in infrastructure investment, reform and regulation, in support of sustainable development. Power Futures Lab's focus at present is in the electricity sectors. Power Futures Lab works on three fronts, providing:

- Executive and professional short courses;
- Research related to the frontiers of infrastructure investment, reform and regulation in Africa, and
- Professional support and policy advocacy.

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