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Private Power Investments in Sub-Saharan Africa: 2021

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Power Futures Lab Working Paper

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Frequently used acronyms and abbreviations

AfDB	African Development Bank
BESS	Battery Energy Storage System
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
C&I	Commercial and Industrial
CSP	Concentrated Solar Power
DFI	Development Finance Institution
EAIF	Emerging Africa Infrastructure Fund
EPC	Engineering, Procurement, and Construction
EU	European Union
GW	Gigawatt
HFO	Heavy Fuel Oil
IPP	Independent Power Projects
KW(h)	Kilowatt (hour)
MIGA	Multilateral Investment Guarantee Agency
MW(h)	Megawatt (hour)
OCGT	Open Cycle Gas Turbine
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PV	Photovoltaic
REI4P	Renewable Energy Independent Power Producers Procurement Programme
RFP	Request for Proposal
SSA	Sub-Saharan Africa
UK	United Kingdom
US($)	United States (Dollar)

Introduction

Sub-Saharan Africa (SSA) lacks the power required to realise its development goals. According to the International Renewable Energy Agency, the region requires cumulative investments of up to US$ 330 billion, mainly from renewable energy, to meet its power generation needs by 2030. However, public investment remains constrained. The COVID-19 pandemic aggravated this situation as governments' attention was divided amongst competing financing needs in critical sectors of their economies. This reinforced the need for alternative sources of power generation investments, such as Independent Power Projects (IPPs). These greenfield grid-connected utility-scale (greater than 5 MW) generators, developed, financed, constructed, majority-owned, and operated by the private sector, remain one of the fastest-growing sources of investment in SSA's power sector.

IPP investments in SSA were relatively depressed in 2020, as the private sector took a cautious approach in committing finance for new projects, given rising public debt levels and sovereign credit ratings downgrades of many countries. However, 2021 saw a solid recovery in private power investments as the infrastructure investment sector adapted to the 'new normal.' Nineteen IPPs from nine countries were financed, amounting to 1.2 GW of new generation capacity and US$ 3 billion in total investment. While large-scale conventional projects such as hydropower and Closed Cycle Gas Turbine (CCGT) plants together received considerable attention, solar photovoltaic (PV) projects attracted the highest investments and remained the most widespread technology . The year also welcomed several record-breaking IPP transactions, especially for clean power generation. Many countries reached financial close on their first or largest IPP, renewable power project, or solar PV with battery storage project. The role of Development Finance Institutions (DFIs) in supporting the roll-out of IPPs through technical assistance, direct concessional finance, credit enhancements, and security arrangements was also reemphasized. These institutions contributed nearly three-quarters of IPP investments, tripling the amount they had provided in the previous year and representing their second largest total contribution in a single year. The provision of risk mitigation facilities by DFIs remained critical, especially considering the pandemic's effect on the creditworthiness of SSA utilities.

Nineteen new IPPs came online, a significant increase from the preceding year, where many projects had been delayed due to supply disruptions and labour movement restrictions caused by COVID-19. These newly grid-connected IPPs, a third of which was contracted through Bid Window (BW) 4 of South Africa's Renewable Energy Independent Power Producers Procurement Programme (REI4P), totals around 1.2 GW in generation capacity.

Competitive tenders or auctions, the primary mechanism for contracting renewable IPPs in SSA, were impacted by the pandemic in 2020. Nevertheless, 2021 saw increased implementation of these programmes for a record number of projects, mainly from South Africa. Eight auction programmes for 43 renewable energy IPPs, with a combined generation capacity of 5 GW, advanced in the region. These potential investments are considerably higher than the 2.3 GW generation capacity from 19 IPPs that progressed in the previous year. Record-breaking prices for solar PV (US$c 2.47/kWh[1]) and wind (US$c 2.27/kWh[2]) were also realised in Bid

[1] Exchange rate as at the time of award: ZAR 1 = US$ 0.066
[2] Exchange rate as at the time of award: ZAR 1 = US$ 0.066

Window 5 of South Africa's REI4P. eSwatini and Lesotho procured their first renewable IPPs, while Namibia hosted the region's first large-scale green hydrogen production project tender, and the first concentrated solar power project tender outside South Africa.

2021 also saw an increasing appetite for distributed generation as especially energy-intensive and extractive commercial and industrial (C&I) consumers sought out cheaper and reliable alternatives to the national grid. Fifteen countries hosted new investments, risk mitigation facilities, or competitive tenders for C&I projects. Regulatory reforms in South Africa and Ethiopia, permitting power generation for self-use and power procurement by local government and the private sector will further incentivise new investments in the distributed generation space.

SSA governments also began to prioritise investments in clean energy dispatchable generators to address reliability and grid integration concerns. One of the most transformative developments in this regard was the increased support of utility-scale battery storage. Remarkably, the region will be welcoming some of its earliest utility-scale grid-connected battery energy storage system (BESS) projects, following the financing of solar PV with BESS IPPs in Malawi, Madagascar, and Mozambique. Geothermal power projects were also significantly backed by DFIs, through development grants funding drilling programmes and surface studies for IPPs implementing such projects in East Africa. Several studies on the potential of green hydrogen were conducted in Southern Africa due to the subregion's vast wind and solar renewable energy resources.

The lack of transmission capacity is becoming a major constraint to new power generation investment, including in Ghana, Mozambique, and South Africa[3]. This challenge represents the next frontier of investment for the region, potentially also using private finance and/or strategic DFI funding. On a positive note, investments in national transmission networks and cross-border interconnectors were boosted in 2021, mainly by DFIs, allowing for new IPP generation capacity injection in the future. Specifically, more than US$ 1.5 billion was committed for the maintenance and construction of new transmission infrastructure.

2021 was, however, not without challenges. The completion of works on SSA's first coal-fired IPP in Zimbabwe since the last facility financed in 2015, despite global commitments at the 26th Conference of the Parties to cease fossil-fuel financing, threatens to thwart the region's sustainable energy ambitions. Troubling experiences with IPPs in a few countries also underscored the critical role of dynamic, least-cost, and sustainable system expansion planning translated into transparent, predictable, and timely competitive procurement windows to realise balanced investor and development outcomes and ensure IPP sustainability. Increasing supply chain costs amidst fragile political and economic conditions, especially in frontier markets post-COVID-19, has led to fears that IPPs, particularly renewables, that have signed PPAs with governments but are yet to complete construction might no longer be viable. The region's lack of transmission capacity is presenting a considerable brake on new power generation investment and renewable energy integration.

The rest of this working paper highlights private power investments and related initiatives supporting such investments in SSA in 2021, with a focus on how partnerships between governments, multilateral institutions, donor agencies, and the private sector are enabling the region to attract new IPP investment.

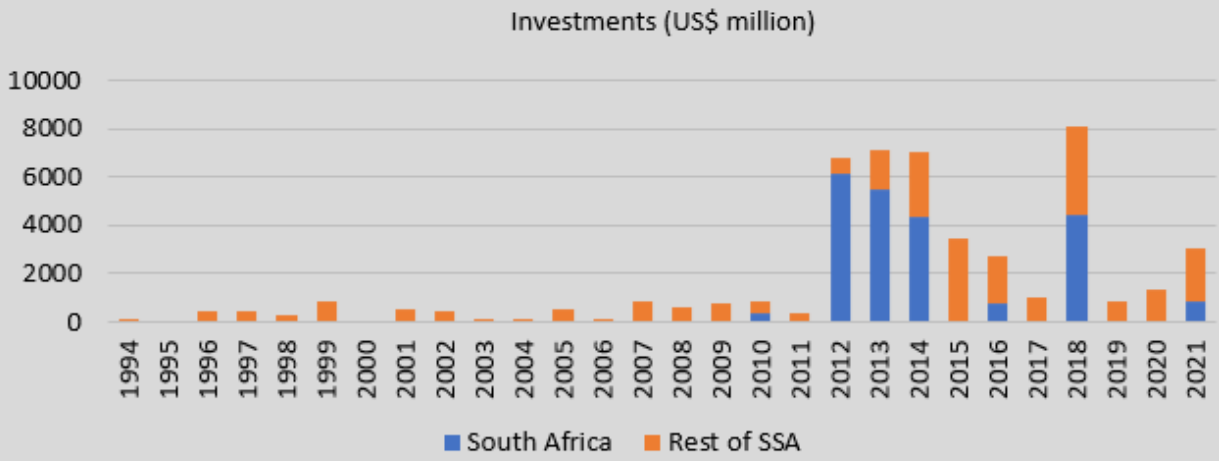
[3] See "Power Africa Transmission Roadmap to 2030: A Practical Approach to Unlocking Electricity Trade" by the USAID in https://www.usaid.gov/sites/default/files/documents/1860/PA_Transmission_Roadmap_508.pdf

Financing IPPs

IPPs remain one of the fastest-growing sources of investment in SSA's power sector. In 1994, Côte d'Ivoire became the first SSA country to attract a foreign-led IPP to sell power to its network through a long-term PPA with the state utility. Since then, IPPs have gradually spread across the region. IPPs are now present in 33 of 46 SSA countries. Six countries welcomed their first IPPs in the last three years. Still, investments remain concentrated in a few countries, mainly due to most SSA countries' relatively small power systems. Overall, 313 IPPs have reached financial close (i.e. when all the funds required for project construction have been fully mobilised[4]) to date, representing around 22 GW generation capacity and US$ 50 billion total investment. Figure 1 shows the evolution of annual private power investments in SSA.

FIGURE 1

Annual Investment of IPPs in SSA by year of financial close



IPP investment levels in 2021 increased to their highest levels since 2018. As previously mentioned, 19 IPPs from nine countries reached financial close, representing 1.3 GW of new generation capacity and US$ 3 billion in total investment. Most of the 2021 investments were concentrated in Southern African countries, including South Africa, Mozambique, and Angola, as seen in Figure 2(a). Central Africa, the subregion arguably most in need of new power generation capacity, did not receive any investment.

New IPP investments were spread almost evenly across the nine countries, as shown in Figure 2(b), except for Angola and Zimbabwe, which attracted private funding for five and four solar PV projects, respectively. While large-scale conventional projects such as hydropower and CCGT plants together received considerable attention, solar PV attracted the most investments and remained the most widespread technology (see Figure 3). These projects featured a mixture of directly negotiated and competitively tendered contracts. Nevertheless, most IPPs procured in SSA (including South Africa) in the last decade have been through a structured procurement program: Feed-in-Tariffs (FiTs) and auctions. DFIs remained pivotal in the

[4] See "Understanding Power Project Financing" by the United States Department of Commerce in http://alsf.afdb.org/sites/default/files/resources/Understanding%20Power%20Project%20Financing%20.pdf

development and implementation of IPPs. About 70% of total IPP investments in 2021 came from these institutions. They also supported several IPPs with various novel credit enhancement and security facilities. A more detailed examination of the role played by DFIs in attracting and supporting IPPs is described in the *Persisting role of DFIs* section.

FIGURE 2

IPPs investments by country in 2021

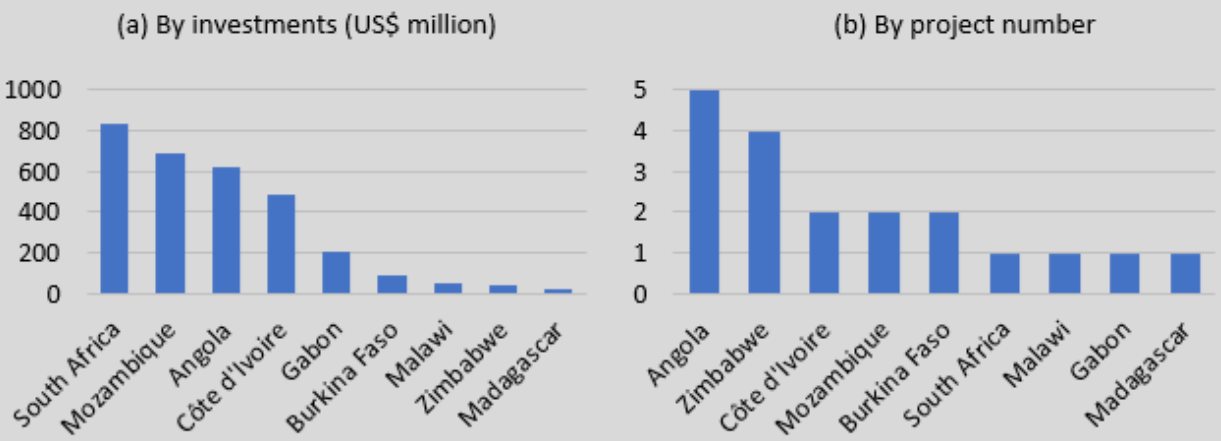
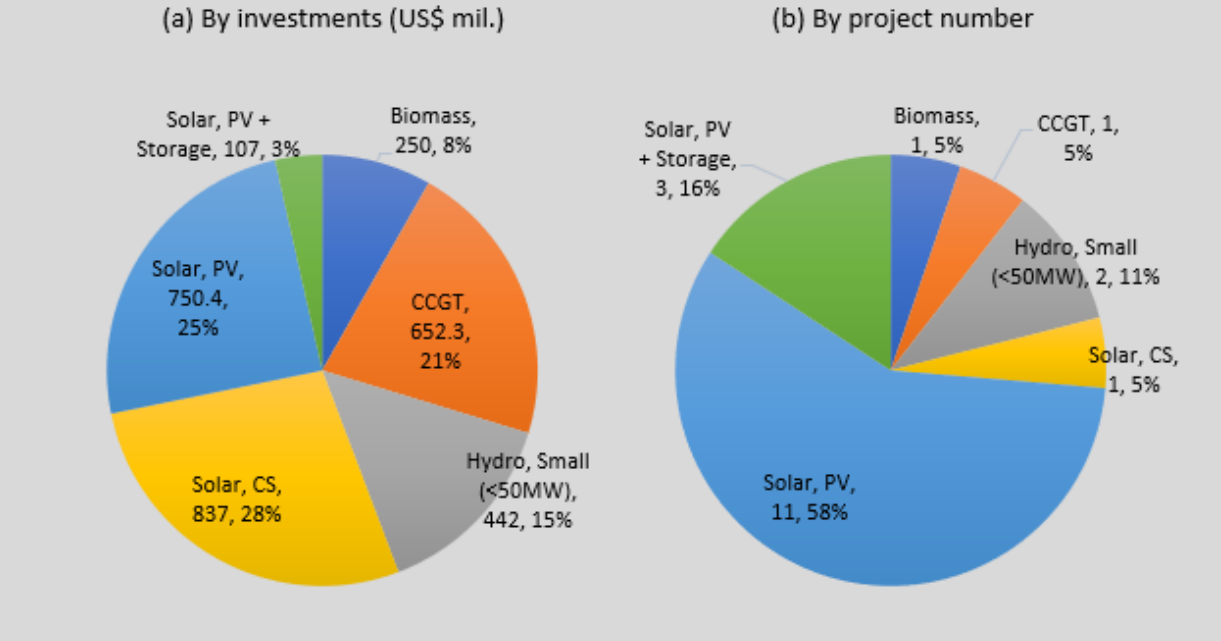


FIGURE 3

2021 technology mix of IPP investments in SSA



Various notable investments were recorded in the IPP sector in 2021, mainly for clean power generation. Gabon closed its first-ever (renewable) IPP, the 35 MW Kinguele Aval run-of-river hydropower project. Angola will be hosting its first and SSA's largest single solar PV power facility, the 188.8 MW plant in Biópio. Burkina

Faso, a country whose power mix is dominated by fossil-fuel generators, reached financial close on its largest IPP, the 38 MW Kodeni solar power plant. Cote d'Ivoire reached financial close on its first two renewable energy private power projects, the 46 MW Biovea biomass and 44 MW Singrobo-Ahouaty run-of-river hydropower projects. Madagascar will be welcoming the biggest single solar PV with battery storage facility in the entire Indian ocean: the 20 MW phase 2 extension of the 40 MW Ambatolampy solar power project. The 450 MW Temane gas-to-power project, arguably one of the largest gas-fired IPPs in SSA, reached financial close in Mozambique.

The rest of this section describes the investment sources and risk mitigation instruments underpinning the IPPs that reached financial close in 2021 per country. Again, IPPs here are considered as greenfield grid-connected utility-scale (greater than 5 MW) generators, developed, financed, constructed, majority-owned, and operated by the private sector. IPPs are recorded by financial close year, rather than when tenders are issued, project developers announce projects, or when plants reach commercial operations. However, these developments are tracked as well as other private power generation investment deals, including transactions with large consumers, some of which are discussed further in this working paper.

Angola

Angola is set to welcome its first and SSA's largest solar PV power plants, having attracted funding of US$ 650 million for a portfolio of projects comprising five grid-connected and two distributed solar PV generators in March 2021. The five grid-connected projects now under construction include a 188.8 MW plant in Biópio, the largest single solar facility in SSA, a 96.7 MW plant in Benguela, a 26.71 MW project in Saurimo, another 26.71 MW project in Luena, and a 14.65MW facility in Cuito. These projects, forming close to half of the country's 2025 target for installed generation capacity (800 MW), are developed by a consortium led by US-based renewable energy company *Sun Africa*. The consortium is also reported to comprise Portuguese engineering company *MCA Group* and another United States (US) company *NEXTracker*.

Around three-quarters of the total project cost will be financed by a few DFIs, including the *Swedish Export Credit Corporation* (SEK), through an export credit facility guaranteed by *Swedish Export Credit Agency* (EKN). Other financiers include the *Korea Trade Insurance Corporation* (K-Sure) and *Development Bank of South Africa* (DBSA). The overall finance package from these institutions will be syndicated by Dutch financial institution *ING Bank*, with repayment of the loan scheduled over 18 years. The remaining project cost will be borne by the developers. The project's Engineering, Procurement, and Construction (EPC) conglomerate is led by co-developer MCA Group. Swiss company *Hitachi ABB Power Grids* is designing, supplying, and commissioning the main infrastructure to connect the project to the country's transmission network, while South Korean company *Hanwha Q-Cells* is providing the solar modules for the project.

Burkina Faso

2021 saw Burkina Faso make significant progress in private renewable energy investments. The country secured financing for two solar PV projects with a combined capacity of 68 MW, representing around 20% of its installed capacity. The first of these projects is the 30 MW Urbasolar Pa power project situated in the Pa municipality. This project was reported to have commenced early construction works with equity capital in

2020, but only achieved financial close on its total cost of US$ 41 million[5] in March 2021. The sole debt provider for the project is the *Emerging Africa Infrastructure Fund* (EAIF), a part of the *Private Infrastructure Development Group* (PIDG), funded by the governments of the *United Kingdom* (UK), the Netherlands, Switzerland, Australia, Sweden, and Germany and the World Bank Group's *International Finance Corporation* (IFC). EAIF is contributing a loan of US$ 34 million, 80% of the total project cost, with the balance provided as equity by the developer.

The 38 MW Kodeni solar power plant located in Bobo-Dioulasso city and developed by West Africa-focused and French-headquartered renewable energy IPP *Africa REN* was the second solar farm to secure construction capital in Burkina Faso in 2021. The construction of the project cost US$ 49 million, with US$ 39 million provided as a loan, syndicated by the *Netherlands' Development Finance Company* (FMO) from itself, the FMO-managed *Access to Energy Fund*, and the *Interact Climate Change Facility*. The developer provided the remaining finance as equity. The advancement of Kodeni was enabled by several risk mitigation instruments to improve the credit risk of *Société Nationale d'Electricité du Burkina Faso* (SONABEL), including a 3 to 6 months letter of credit provided by a commercial bank and a sovereign guarantee by the Burkinabe government. INEO, a subsidiary of *Engie Group*, is providing EPC services for the project. Kodeni commenced construction in October 2021 and will be the largest solar power plant in the country on completion, envisaged for mid-2022.

The Kodeni and Urbasolar Pa projects were two of six solar projects that were awarded 25-year Power Purchase Agreement (PPA) build-own-operate-transfer (BOOT) contracts at a tariff of US$c 7.9/kWh[6] by SONABEL following a competitive tender process in April 2019. The remaining projects, the 30 MW Nagreongo plant developed by *GreenYellow*, 20 MW Zano and 15 MW Dedougou facilities by *Quadran*, and 30 MW Kalzi solar farm by *Naange*, are now at various stages of financing and are expected to reach financial close imminently. FMO, the mandated lead arranger for the Kodeni facility, is leading the syndication of finance for Nagreongo and Zano. The World Bank Group's *Multilateral Investment Guarantee Agency* (MIGA) is providing a US$ 5 million insurance cover for the developer of Nagreongo GreenYellow. The guarantee will protect the developer against the risks of currency inconvertibility and transfer restrictions, expropriation, breach of contract, civil unrest, and war for 20 years.

Cote d'Ivoire

Cote d'Ivoire, the first country to welcome an IPP in SSA and one of the most attractive destinations for such projects (particularly gas-fired plants) in the region since then, attracted its first two renewable energy IPPs in 2021. The first project is the 46 MW Biovea biomass plant, situated in Aboisso district and reputed as SSA's largest grid-connected biomass power plant. This power station is developed by the Biovea Energie Special Purpose Vehicle (SPV), the legal entity implementing the project, comprising *Electricite De France* (EDF) and *Biokala*, a joint venture between French-based asset manager *Meridiam* and local company *SIFCA Group*. In December 2019 the SPV signed a concession arrangement with the government to build, finance, construct, and operate the plant for 25 years at a tariff of US$c 11/kWh[7]. Ownership of the facility will be transferred to

[5] The exchange rate applied for Euros-denominated investments throughout the working paper is the rate as at the time of investment.
[6] Exchange rate as at the time of award: XOF 1 = US$ 0.0016
[7] Exchange rate as at the time of award: XOF 1 = US$ 0.0018

the state after the duration of the agreement. Debt finance for the project, with a total cost of US$ 250 million, was provided by EAIF and Proparco, the private sector arm of French development body the *Agence Française de Développement* (AFD) in June 2021. Proparco provided US$ 160 million in concessional debt finance and US$ 6 million in grants. EAIF contributed US$ 35 million in concessional debt and US$ 9.6 million in grants through its parent *PIDG Technical Assistance*. French-headquartered company *Bouygues* will construct the project. *PalmCi*, a subsidiary of SIFCA, will provide the project's biomass fuel through a long-term fuel supply arrangement, with 30% being sourced directly from PalmCi's existing industrial palm oil plantations, while the rest will come from out-growers.

The 44 MW Singrobo-Ahouaty run-of-river hydropower plant, located on the Bandama River and reputed as West Africa's first run-of-river hydropower plant, was the second renewable energy IPP to secure project finance in Cote d'Ivoire in 2021. Financial close for the US$ 204 million project was first announced in December 2020, after the *Africa Finance Corporation* (AFC), a pan-African multilateral DFI founded by sovereign African states, provided a 3-year bridge loan to the tune of US$ 170 million, allowing the project to proceed with construction. Bridge loans are innovative financing mechanisms that enable IPPs to commence construction with short-term debt finance to shorten their development life cycle significantly. In 2021, the *African Development Bank* (AfDB) syndicated the long-term debt finance for the project. Other lenders include the EAIF and *German Investment Corporation* (DEG), a part of the *German development bank* (KfW). The SPV comprises local company *Ivoire Hydro Energy*, AFC, and Morocco-based developer and investor *Neo Themis*. The project is built by French EPC contractor *Eiffage* and after completion will sell its power to *Compagnie Ivoirienne d'Electricité*, the operator of Côte d'Ivoire's national grid, through a long-term PPA.

Gabon

Gabon secured financing for its first IPP with the 35 MW (US$ 202 million) Kinguele Aval run-of-river hydropower project in the Estuaire province in July 2021. Kinguele Aval is developed by *Asonha Energie*, a consortium comprising *Gabon Power Company* (GPC), a portfolio company of the *Gabonese Strategic Investment Fund* (FGIS), and *Meridiam*. The project's gearing ratio, a measure of the portion of the project's costs funded by debt versus equity, is particularly high at 85:25. The debt for the project was provided by several DFIs, including the World Bank Group's IFC, contributing US$ 37 million from its account and drawing a concessional senior loan of about US$25 million from the *Canada-IFC Renewable Energy Program for Africa*, a partnership between the Canadian Government and IFC to catalyse renewable energy IPP investments in SSA. Other lenders, including EAIF, DBSA and the AfDB, provided an additional US$ 111 million loan for the project. AfDB is contributing a total of US$ 44 million, of which US$ 23 million will come from its account, US$ 11 million from the *Africa Growing Together Fund*, and US$ 10 million from the *Sustainable Energy Fund for Africa*, both of which it administers. MIGA is also providing an undisclosed amount of insurance to protect Meridiam against political risks. The power from the Kinguele project will be sold to the state utility *Société d'Energie et d'Eau du Gabon* (SEEG) under a 33-year concession agreement with the government. *Sinohydro* has been appointed as EPC contractor, with commercial operations for the project envisaged before 2025.

Madagascar

Madagascar has one of the lowest electrification rates in SSA and has a power sector dominated by rented (emergency) thermal-based generators but is now set to host the largest single solar PV facility in the entire Indian ocean. GreenYellow and locally-based pan-African Axian group, announced in June 2021 the start of the expansion of the Ambohipihaonana (Ambatolampy) solar power plant to 40 MW. This extension also included incorporating a 5 MWh battery storage facility to stabilise the grid of the state electricity utility *Jiro sy rano Malagasy* (JIRAMA). The 20 MW first phase of the plant, which was the country's first grid-connected solar power project, was financed and built by GreenYellow in 2018 to sell power to JIRAMA under a 25-year PPA. In 2020, Axian group acquired a 51% stake in the project, and later that year the project company concluded a US$ 19 million refinancing transaction syndicated by French investment bank *Société Générale* alongside local lenders *Banque Malgache de L'ocean Indien* and *Banque Nationale d'Investissement*. *GuarantCo*, the "guarantee" arm of the PIDG and African Guarantee Fund also provided guarantees of US$ 9.3 million and US$ 3.8 million, respectively. By covering payment risk default by JIRAMA, these guarantees enhanced the project's bankability, particularly for the Malagasy banks who contributed finance for the project in local currency. The phase 2 extension of the project, which has now been included in the initial PPA, cost around US$ 21 million, organised by Axian Group and GreenYellow. While it was reported that the debt financiers of the project's first phase indicated an interest in funding this extension, it is currently unclear if they backstopped the expansion in any form. The project company announced the commercial operation of this extension in April 2022.

Malawi

Malawi, a country dependent on hydropower, attracted much-needed private solar power investment in 2021. The country welcomed SSA's first utility-scale grid-connected battery storage plant, with the 20 MW solar PV with 5 MW/10 MWh (i.e., 2-hour duration) lithium-ion battery storage plant in Golomoti reaching financial close in March 2021. *African Trade Insurance* (ATI) further announced that it would be providing short-term liquidity risk cover against the risk of late electricity payment by the state-owned electricity company *ESCOM* for the power project through its *Regional Liquidity Support Fund* (RLSF). This project becomes the fourth to benefit from ATI's RLSF, a Fund launched four years ago and backed by the KfW to enhance the bankability of renewable IPPs in SSA and shorten their finance securitisation journey.

The Golomoti project (US$ 50 million) is developed and entirely funded by project company *Golomoti JCM Solar Corporation Limited*, formed by Canadian renewable energy IPP *JCM Power* and *InfraCo Africa*. The wholly equity financing structure was assumed to accelerate project development and materially de-risk the project for lenders who were expected to provide financing following the facility's commercial operation. The project came to light after ESCOM ran its first international competitive tender in December 2016 to allow IPPs to set up and establish solar power stations that will supply power to the national grid under a 20-year PPA. The four sites identified were Salima, Nkhotakota, Lilongwe, and Golomoti. The JCM Power and InfraCo Africa consortium won the tender in June 2017 to develop the Golomoti facility at a tariff of US$c 9.49/kWh. The PPA was officially signed between the project company and ESCOM in September 2018.

The battery storage component was not part of the initial tender or project finance. The developer recognised that many solar power projects (around 150MW) were expected to be connected to the grid soon, introducing concerns such as high ramp rate (rate in change of power production). Hence, they applied for grants to incorporate the BESS and maintain the existing tariff, to showcase how solar PV combined with storage can provide greater value as a future source of generation. The *US Trade and Development Agency* (USTDA) supported the project's feasibility studies, particularly the inclusion of battery storage, through a US$ 0.7 million grant. Later on, the UK government provided a US$ 2.8 million grant through Innovate UK to provide state-of-the-art battery storage systems. The developer envisages that the BESS will minimise the plant's ramp rate due to cloud cover, provide power during evening peaks, and respond to contingency events on the network to enhance network recovery. Chinese company *Sungrow* will supply the associated components of the BESS. The project is expected to become operational during 2022.

Most of the projects awarded on the three other identified sites for solar power development by ESCOM in 2016 have progressed significantly. The 60 MW Salima project, also co-owned by JCM Power and InfraCo Africa, became operational in 2021. The 46 MW Nkhotakota project developed by UAE-based developer *Phanes Group* and Swiss asset manager *responsAbility* reached financial close in 2020 and is now under construction, with commercial operations envisaged sometime in 2022. The 25 MW Lilongwe project by French-headquartered IPP *Voltalia* is currently unfinanced but is steadily progressing, with financial close expected soon.

Mozambique

Mozambique, one of the countries with the lowest electrification rates in SSA, is set to host two transformational IPPs, after seeing one of the region's earliest utility-scale grid-connected solar plus battery facilities and fifth-largest IPP secure financing in 2021. The 15 MW (US$ 36 million) Cuamba solar farm with 2 MW / 7 MWh battery energy storage in Niassa province secured construction capital in December 2021, becoming the third solar plus battery storage project to close in SSA. The full capital for the power project, including an upgrade to the existing Cuamba substation, was obtained through a US$ 19 million concessional loan from EAIF and US$ 7 million grant via its parent PIDG Technical Assistance. *British International Investment* (BII), formerly *CDC Group*, also provided a US$ 1 million grant to improve the project's bankability, particularly the inclusion of the BESS. The majority shareholder of the SPV is *Globeleq*, owned by BII and *Norfund*, Norway's DFI. Other project partners include Lusophone Africa energy developer *Source Energia*, a subsidiary of *Source Capital* and the Mozambican state power utility *Electricidade de Mozambique* (EDM). Spanish company *Grupo TSK* is constructing the project, while *Alvealia Group*, another Spanish firm is supplying the storage system through its subsidiary *E22 Energy Storage Solutions*. The project is expected to start selling power to EDM by the second half of 2022 under a 25-year PPA.

The 450 MW Temane gas-to-power project, which reached financial close in December 2021, will see Mozambique more than double its installed IPP capacity. Loans for the US$ 652.3 million project were provided by IFC along with FMO and EAIF, together contributing US$ 253.5 million; *US International Development Finance Corporation* (DFC) - US$ 191.5 million; and the *Organization of the Petroleum Exporting Countries (*OPEC) *Fund for International Development* (OPEC Fund) - US$ 50 million. The project, located in the Inhambane province, is a joint venture between Globeleq, the lead developer, and other partners, including EDM, UK-based infrastructure developer *eleQtra*, and South African energy and chemical group *Sasol*. MIGA

is also providing about US$ 250 million to protect Globeleq, eleQtra, and Sasol against political risks. Following completion, the project will sell power to EDM through a 25-year tolling agreement using natural gas supplied by Sasol and the state's oil and gas company *Empresa Nacional de Hidrocarbonetos* from the Pande-Temane fields. About three-quarters of the project's power will be produced using CCGT technology, with the rest from OCGT. The EPC contractor for the project is Spanish company Grupo TSK, employing Siemens gas turbines and aiming for commercial operations by 2024.

South Africa

The eventual closing of the funding arrangement of the 100 MW Redstone Concentrated Solar Power (CSP) plant meant that all South African IPPs contracted between BWs 1 and 4 of the REI4P were fully financed, except for the Mkuze biomass project. The project, located in the Northern Cape province, experienced several setbacks since its award to a consortium led by Saudi Arabia's power generation giant *ACWA Power* in December 2014 via a special REI4P bid window for CSPs (BW 3.5). The other CSP project awarded during this round is the operational 100 MW Kathu project developed by the French energy company Engie Group. Redstone was delayed due to conditions by the IPP and state utility not being fulfilled at the time. This delay left the Redstone project in limbo along with 26 other renewable energy IPPs selected in the REI4P BW 4, whose PPAs were yet to be signed due to Eskom's hesitance to ratify the arrangements and the *Department of Mineral Resources and Energy's* (DMRE) reluctance to continue the REI4P. The PPAs for the BW 4 projects (including Redstone) were eventually signed in April 2018.

Financial close for the US$ 837 million Redstone project was assumed to be within reach in 2019 after several DFIs agreed to fund the project. However, financing was hindered as US IPP *SolarReserve*, an initial equity provider and technological component supplier for the project, declared bankruptcy. Pressures around tariff renegotiations of REI4P contracts by Eskom also interrupted the project's advancement. The other owners of the project are all local entities, including renewable energy developer *Pele Green Energy*, state-owned *Central Energy Fund*, a pension fund, and the *surrounding community*. Redstone finally reached financial close in May 2021 after a host of DFIs, including BII, AfDB, FMO, DEG, and DBSA and local commercial lenders such as *ABSA*, *Investec*, *Nedbank*, and *Sanlam* agreed to fund the project. The reliable power supply from the plant would provide ancillary services to the South African grid, whose variable renewable energy capacity is steadily increasing. US company *Acciona* has been delegated as the EPC provider. The leading equipment suppliers include Belgian engineering firm *John Cockerill*, US-based solar thermal technology developer *BrightSource Energy*, and US electrical services company *CMI*. ACWA Power's subsidiary, *First National Operation and Maintenance* (NOMAC), will operate and maintain the power plant. The project is now under construction, with commercial operations expected between late 2023 and early 2024.

Zimbabwe

Zimbabwe is diversifying its electricity mix dominated by dirty coal and drought-prone hydropower plants through the introduction of, and legislative support for, renewable energy. Renewable energy IPPs have been granted 'National Project Status' by the Ministry of Finance and Economic Development, meaning that such projects will enjoy a 5-year tax holiday. Within the last three years, the country has seen six utility-scale solar PV projects with a combined capacity of 65.5 MW reach financial close. However, construction for many of

these projects has experienced several roadblocks due to currency conversion challenges and the increasing price of solar components. The Zimbabwean Electricity Regulatory Agency (ZERA) announced in June 2021 that seven projects, including six solar PVs and a thermal power plant, were under construction and expected to come online before the end of the year.

The solar projects include the 5 MW Cross Mabale power plant, the 20 MW Harava solar park, a 5 MW first phase of the 20 MW Sunset Technologies power plant, the 5 MW Wartrail power plant, the 25 MW Chidobe-Mizpah power plant, and the 5.5 MW Guruve solar park. The thermal power plant is the 50 MW first phase of the 320 MW coal-fired Deka farm. The 5 MW Cross Mabale and 20 MW Harava solar power plants reached financial close in 2018. The Cross Mabale project in the Matabeleland North province, licensed by ZERA in August 2016 and owned by *SolGas (Pvt) Ltd*, commenced construction in 2019 and began commercial operations in 2021. The project has a 25-year PPA with the Zimbabwean Electricity Transmission and Distribution Company (ZETDC). The 20 MW Harava Solar Park in the Mashonaland East Province is developed by a consortium comprising major stakeholders – Botswanan renewable energy company *Invest Solar Africa* and pan-African investment bank *Old Mutual*, and minority shareholders, *Ainos Ngadya* and the *Seke Community Trust*. The 6 MW first phase is already operational, with the remaining capacity due to be grid-connected soon. The project was licensed by ZERA in January 2018 and has a 20-year PPA with ZETDC.

The other four announced solar power plants only secured their construction capital and commenced construction in 2021. However, the detailed funding arrangements for these projects are yet to be made public. Construction for the first 5 MW phase of the 20 MW Sunset Technologies power plant costing around US$ 4.5 million commenced in 2021. The power plant, licensed by ZERA in September 2016, is situated in the Matabeleland North province and is developed by *Richaw Solar Tech (Pvt) Ltd*. Another local engineering company with Southern African-focused operations, *New Sahara Ventures (NSV)*, is serving as the EPC contractor, with the solar panels to be supplied by Chinese solar company *JinkoSolar*. NSV is also reported to have contributed to the project's financing. The project will sell power to the ZETDC through a 25-year BOO arrangement.

The 5 MW Wartrail power plant in the Matabeleland South province is developed by *Plum Solar (Pvt) Ltd*. The project was licensed by ZERA in March 2015. The facility, possessing a 25-year BOO PPA with ZETDC started construction in 2021. The 25 MW Chidobe-Mizpah power plant is situated in the same province. The facility, owned by *Power Ventures (Pvt) Ltd*, started development after being granted a generation licence by ZERA in April 2020. The project has a 25-year BOO PPA with ZETDC and began construction works in 2021. Lastly, the 5.5 MW Guruve Solar Park in the Mashonaland Central province is developed by the SPV – *Guruve Solar Park (Pvt) Ltd*. The project was granted a licence in April 2019 and has a 25-year BOO PPA with ZETDC. The project is now under construction, with NSV acting as the EPC provider.

The completion of works on the 50 MW first phase of the 320 MW Deka coal-fired thermal power plant meant that SSA welcomed its first coal IPP since the 300 MW Maamba mining-and-power project in Zambia reached financial close in 2015. The Deka project in Matabeleland North Province is owned by *Zimbabwe Zhongxin Electrical Energy (Pvt) Ltd*., a joint venture between *Qualisave Mineral Resources of Zimbabwe* and *Yuxia Zhongxin Coking Company of China*. The project received a generation licence in November 2019 and has a PPA for 25 years with ZETDC. An initial 25 MW was reported as being complete in June 2021, with the remaining 25 MW expected to come online before the end of the year. The Zimbabwean government also granted a coal mining concession to the SPV within the power plant's vicinity in 2019. However, the country's

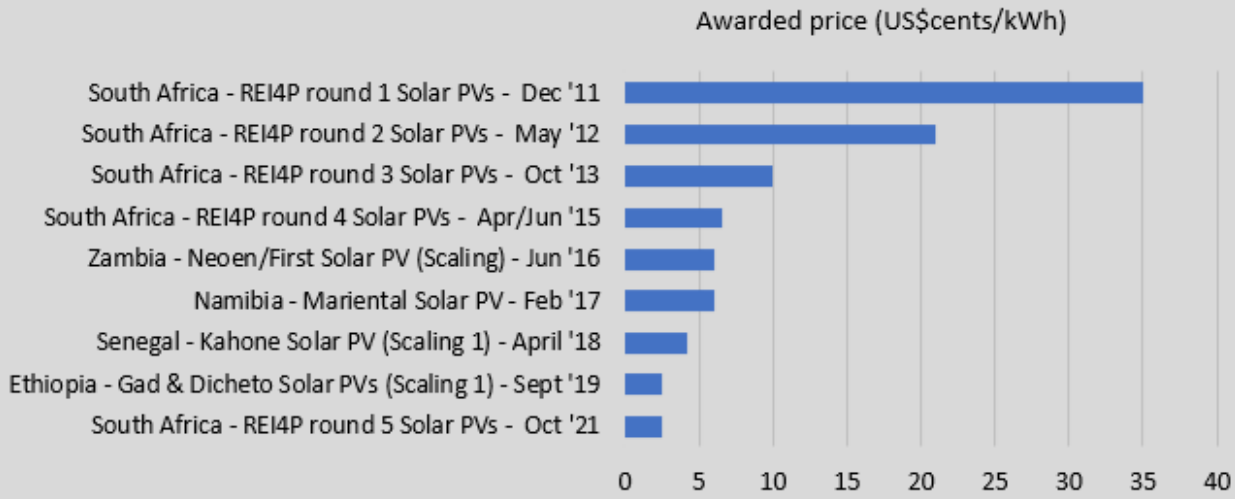
Environmental Lawyers Association appealed to the High Court to stop the project company from mining coal, noting that such operation would result in severe ecological degradation and harm wildlife. This plea resulted in the cancellation of the mining concession in 2020.

Auctions for Renewable IPPs

SSA's generation capacity expansion drive coincides with the period of global financial and regulatory support for renewable energy. This unprecedented opportunity affords the region the chance to leapfrog the more industrialised countries, most of whose economies are underpinned by fossil fuels, as a global green economy leader. Power sector reforms enabling the introduction and increased participation of the private sector have altered the dynamics of the region's power generation mix, particularly the addition of more renewables. Since 2010, 82% of IPPs that have reached financial close are renewable energy-based. The modalities for procuring such projects have proven to be one of the critical factors determining their successful realisation[8]. Unsolicited proposals (direct negotiations[9]) benefit from the transference of early-stage project identification and assessment risks to the private sector. However, directly negotiated contracts are usually non-transparent quick fixes and generally do not conform with the government's long-term power sector plans and priorities. The lack of competition in these proposals also typically results in high generation tariffs.

FIGURE 4

Evolution of record-setting solar PV prices in auctions in SSA



Conversely, auctions, if properly coordinated and implemented and appropriately linked to the country's power sector plans and strategies, can result in transparent selection outcomes, and systematically deliver vast volumes of power promptly. Data on the construction pace of utility-scale private generators indicate that for similar technologies, IPPs procured through auctions are constructed faster than those through direct negotiations. The competitive tension provided by auctions also generally drives down prices. Figure 4 showcases how auctions have enabled solar PV projects to become one of the cheapest technologies for electricity generation.

[8] See "Renewable Energy Auctions: A Global Overview" by Wikus Kruger, et. al. in https://www.gsb.uct.ac.za/files/EEG_GlobalAuctionsReport.pdf

[9] See "Creating Competitive Tension" by the PPP Knowledge Lab in https://pppknowledgelab.org/guide/sections/80-creating-competitive-tension

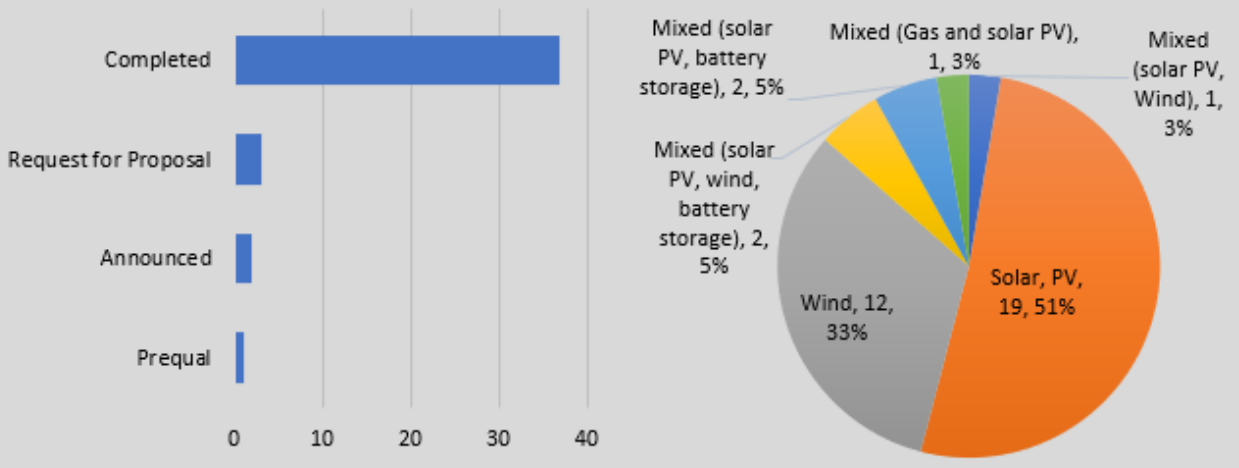
Renewable energy auctions continue to spread across SSA and are now prevalent in all regions, except Central Africa. South Africa has received most of the contracted capacity due to its extensive power system and economy and the relative success of its REI4P. Overall, a renewable energy auction program has at least been announced in 29 countries, and 187 IPPs have been awarded, representing 11 GW of generation capacity. While progress in some of the region's renewable energy competitive tenders was impacted due to the COVID-19 crisis, 2021 saw increased coordination of auctions for a record number of projects, mainly from South Africa: eight competitive tenders for 43 renewable energy projects, amounting to over 5 GW of capacity advanced in SSA (see the breakdown in Figure 5). These numbers are significantly higher than the 2.3 GW capacity for 19 projects in 2020.

Other noteworthy trends in the competitive tendering space in 2021 include record-breaking prices, auctions for new technologies and the growth in commercial & industrial (C&I) tenders. Record-breaking solar PV and wind prices were realized in South Africa's REI4P BW5. Wind power became the cheapest form of renewable technology after the Dwarsrug power plant was awarded to a consortium led by *Mainstream Renewable Power* at a tariff of US$c 2.27/kWh. The lowest price for solar PV also fell to US$c 2.47/kWh.

Two Southern African countries (the Kingdom of Eswatini and Lesotho) with small power systems, partly reliant on South Africa, procured their first renewable energy power project through auctions. Lastly, Namibia hosted two unprecedented tenders, the first for the region's first large-scale green hydrogen production project, the other for the region's first CSP, outside South Africa. The rest of this section details the advancement of competitive tender programmes across the region.

FIGURE 5

Summary of the advancement of grid-connected renewable energy tenders in SSA in 2021



South Africa

South Africa's REI4P can be considered the most successful competitive procurement programme in SSA based on the number of projects developed and quantum of mobilised capital, despite some shortcomings. Five REI4P bid windows have been initiated since 2011, resulting in the procurement of around 9 GW of grid-connected utility-scale renewable power. Nearly all the projects awarded between the first four rounds (i.e. bid window [BW] one to four) have reached financial close, with most already supplying power to the national grid. A remarkable outcome of the REI4P has been local ownership and the development of the local industry[10], which are some of the critical factors enabling project sustainability in SSA. Prices realised have steadily declined from the US$c 14/kWh[11] lowest price in the first bid window in 2011 to the US$c 2.27/kWh tariff achieved in the most recent fifth bid window in 2021, which now represents the cheapest tariff for renewable power in Africa. Falling prices have been realised due to the declining costs of renewable components and increasing competitive tension amongst private sector players. Project development has also been timely, as most contracted projects between BW 1 and BW 4 reached financial close within a year of ratification by Eskom and the DMRE.

South Africa also procured emergency "dispatchable power" through a 2 GW Risk Mitigation Independent Power Producer Procurement Program (RMI4P) launched in August 2020. The RMIPPPP was designed to minimise the short-term electricity supply gap by providing "technology-neutral" dispatchable power – though the design of the tender was inclined towards specific technological solutions. Eleven projects were awarded to six different developers, including seven projects that comprised renewable energy technologies. As a positive development, the RMI4P led to the award of SSA's largest wholly renewable-based dispatchable power plant, the Kenhardt 3 x 50 MW solar PV project with battery storage developed by Norwegian renewables company *Scatec Solar*. Likewise, the US$c 9.9/kWh[12] lowest price in the competitive tender was for a 150 MW hybrid project consisting of solar PV, wind, battery, and diesel technologies, developed by ACWA Power.

However, most of the contracted capacity (around 60%) was awarded to three gas-fired power ships that have zero local content, are relatively expensive, and are responsible for emitting methane, one of the potent greenhouse gases that contribute to climate change. Already, the implementation of the power ships has experienced delays as the Department of Forestry, Fisheries, and the Environment have continuously refused to grant the projects' environmental authorization. Environmental groups have also opposed the project, making financial close very difficult. These floating power plants can be considered a symbol of major failures in the country's long-term power sector planning-procurement strategy. At the time of award, the DMRE envisioned financial close for all the RMI4P projects in 2021 and commercial operations by 2022. None of the contracted projects, including the power ships, were able to achieve this deadline and there is still much uncertainty regarding whether these projects will reach financial close.

Shortly after the procurement of projects under RMI4P, the bid documentation for REI4P BW5 was released, seeking bids for 1600 MW of wind and 1000 MW of solar PV capacity, as per the country's 2019 Integrated

[10] See "The South African Renewable Energy IPP Procurement Programme" by Anton Eberhard and Raine Naude in https://www.gsb.uct.ac.za/files/EberhardNaude_REIPPPPReview_2017_1_1.pdf
[11] Exchange rate as at the time of award: ZAR 1 = US$ 0.1250
[12] Exchange rate as at the time of award: ZAR 1 = US$ 0.0677

Resource Plan (IRP). Six months later, 25 IPPs were selected as preferred bidders from 102 proposals, totalling 12.2 GW. The projects, comprising 12 wind and 13 solar facilities, are expected to reach financial close by Q1 2022 and come online within two to three years.

More remarkable is that these prices were primarily achieved in the presence of high local content and ownership requirements and without the availability of concessional finance from DFIs. Most of the bids were backed by financing from commercial banks. The low-interest rates and long tenors provided by these banks could be attributed to the competitive tension amongst the lenders, prompted by their considerable experience and that of the bidders in the sector. The resumption of REI4P through BW5 therefore reemphasizes that well-designed auctions with the right incentives for investors can deliver low prices in SSA and elsewhere, despite high socio-economic development requirements and cost of capital for renewable energies.

While many positives have been recorded in BW5, a few concerns have been prompted. It is believed that the average solar (US$c 2.85/kWh[13]) and wind (US$c 3.26/kWh) prices could have been much lower, barring the transmission constraints in the Northern and Western Cape provinces. For instance, despite the Northern Cape's abundant solar resource, only two of the awarded solar PV projects would be built in the province, as other competitive offers were overlooked due to grid limitations. . In addition, there is also concern around market concentration: Mainstream Renewable Power (with consortium partner Globeleq, alongside BEE investors *H1 Holdings* and *AREP*) alone was for example awarded 12 projects in BW5, amounting to 1.27 GW renewable energy capacity. Nevertheless, medium-sized local companies such as Red Rocket were also awarded capacity.

The country's recent regulatory reforms allowing the direct procurement of power by local government and the private sector also means that developers have diverse opportunities to enter and participate in the industry. For instance, earlier in 2021, the *eThekwini (formally Durban) Metropolitan Municipality* issued a Request for Information to procure 400 MW capacity from sustainable and dispatchable generation technologies. 104 projects for 16 GW have responded to this competitive tender.

Rest of SSA

The IFC's Scaling Solar initiative, established to propel private utility-scale solar power investment in Africa and arguably now one of the largest multinational competitive procurement programmes on the continent, is supporting the implementation of solar auctions in Cote d'Ivoire and Niger. The initiative facilitates economic and rapid project implementation by addressing the principal impediments to developing solar power in frontier African markets, such as unfamiliar documentation and high risks. It achieves this outcome by supporting the project's development, tendering, and financing processes. Scaling Solar provides feasibility assessments; design and management of a robust and transparent procurement process; bankable and standardized set of contractual documents, such as stapled finance packages; and risk mitigation instruments. Zambia and Senegal are the earliest beneficiaries of the programme's impact, having seen their power projects tendered through the initiative reach financial close within two years.

[13] Exchange rate as at the time of award: ZAR 1 = US$ 0.066

Cote d'Ivoire became the fifth SSA country to join the programme, following in the footsteps of Zambia, Senegal, Togo, and Madagascar[14]. In November 2019, the government of Côte d'Ivoire and the IFC signed an agreement for two 30 MW grid-connected PPP solar projects in Laboa and Touba, situated in the country's western region with high solar radiation. In June 2021, Cote d'Ivoire's *Ministry of Petroleum, Energy, and Renewable Energies* launched a tender, inviting prospective international renewable energy developers to bid to finance, construct, and operate both projects under the Scaling Solar framework. Twenty companies responded to the tender, of which 10 were pre-qualified to continue the selection process in December 2021. Côte d'Ivoire has attempted procuring renewable energy capacity through auctions since 2016 for biomass and solar power plants. These projects include a 25 MW cotton biomass plant in Boundiali, a 20 MW cocoa biomass in Gagnoa, and a 25 MW solar PV in an unspecified location. However, these procurement programmes were unsuccessful, as none of the projects were contracted. The Scaling Solar initiative could help the country realize its first privately financed solar IPP, thanks to the programme's experience and bankable contractual framework.

Niger is the most recent entrant of the Scaling Solar initiative, having joined in June 2021. A few months later, the country's *Ministry of Petroleum, Energy and Renewable Energy* launched a tender to design, finance, construct, and operate a grid-connected 50 MW solar park in Gorou Banda through the same programme. The solar plant has been under consideration since 2017 and will be co-located with a 100 MW diesel-fueled thermal power plant commissioned in the same year and contracted on a short-term basis pending cheaper alternatives, such as the imminent solar farm. AFD and the EU are also supporting the project.

The Kingdom of Eswatini and Lesotho, with small power systems, partly reliant on South Africa, procured their first renewable energy power project through auctions. In June 2019, the Kingdom of Eswatini issued a Request for Qualification (RFQ) to deploy grid-connected solar generation capacity. A few months later, 13 bidders were prequalified from 16 proposals. In April 2021, a consortium comprising London-headquartered Globeleq and pan-Southern African IPP *Sturdee Energy* was awarded two solar projects, the 15 MWs Balekane and Ngwenya plants, located in the Northwest region of the country. Lesotho will also be welcoming its first utility-scale solar IPP, having contracted a consortium led by Scatec Solar to build, own, and operate the 20 MW Neo 1 solar power plant in western Lesotho. The consortium also comprises renewable energy start-up *OnePower*, US company *Izuba Energy*, and the *local pension fund*. The project came to light in 2016 after the consortium was selected to implement the project, following a tender process organized in 2015. Since then, the project has benefitted from a series of development funds, including a US$ 695,500 grant from the AfDB in 2017 and US$ 600,500 from the USTDA in 2019. Debt for the project is expected to come from the UK's private power investment vehicle, the *Renewable Energy Performance Platform* (REPP) and Norfund, with financial close envisaged for 2022. Following completion, the project will sell its power to state-owned utility *Lesotho Electricity Company* for 25 years.

Namibia hosted (or announced) a series of unprecedented tenders in 2021. First, the *Municipal Council of Windhoek* issued an RFQ for renewable IPPs to implement a 25 MW solar plant for 25 years on a BOO basis. Later in the year, Namibia awarded SSA's first large-scale green hydrogen production project through a competitive tender process to *Hyphen Hydrogen Energy*, a subsidiary of *Enertrag*, a German renewable energy

[14] Ethiopia's tender in 2019 was initially a scaling solar transaction but IFC pulled out at the last moment due to a conflict regarding guarantees with the government. See: "Ethiopia Country Report" by Wikus Kruger, Fezeka Stuurman, and Olakunle Alao in https://www.energyeconomicgrowth.org/publication/ethiopia-country-report

company. The government will be granting the developer the right to finance, construct, and operate the project for 40 years. The US$ 4.4 billion first phase of the US$ 9.4 billion project involves the construction of a combined 2GW renewable energy facility comprising solar and wind farms in southwestern Namibia to generate green hydrogen. Namibia also announced its intention to procure a 50 - 130 MW CSP plant with storage through a competitive bidding process in 2022. The project is expected to be developed on a BOOT basis, cost over US$ 600 million, and have a 25-year PPA.

Other Key Trends

Distributed renewable energy generation

As utility-scale grid-connected IPPs become increasingly deployed in SSA, transmission and distribution infrastructures are likely to present a bottleneck to the reliable supply of electricity to consumers. Despite renewed attention by governments and DFIs, the transmission systems are still inadequate to evacuate the steadily increasing generation capacity of the region, evident in the excess generation capacity dilemma in Ghana, Kenya, and Mozambique. Utility-scale grid-connected IPPs also usually take time to contract, requiring long-duration state procurement processes. For these reasons, distributed renewable energy generators, typically installed, and operated separately from the national grid, have become a popular electrification option in SSA. These generators cater for C&I sectors, plagued by unavailable, unreliable, or uneconomical electricity supply and residential settlements, distant from the national grid. While this working paper is focused on utility-scale grid-connected IPPs, the recent increase in investments in the distributed generation space in SSA is becoming noteworthy and thus necessitates more attention. As such, the rest of this section will describe some of the regulatory reforms enabled by SSA governments and initiatives undertaken by DFIs and the private sector to accelerate distributed generation investments.

2021 saw a few countries, including South Africa and Ethiopia, initiate regulatory reforms to allow power generation for self-use and open up generation procurement by local government and the private sector, mainly energy-intensive and extractive sub-segments. In June 2021, South Africa raised the threshold for embedded (self-use) generation for businesses and individuals. These facilities will now be able to generate up to 100 MW without the need for a generation licence from the country's electricity regulator *National Energy Regulator of South Africa*, and wheel and sell their power to multiple customers. A few months later, Ethiopia followed suit after its state energy agency, the *Ethiopian Energy Authority*, authorized self-generation and supply of energy independent from state utility providers.

Financing and risk management

Several MW-scale renewable energy distributed generation projects with support from DFIs and the private sector secured financing in 2021. In January, Finnish DFI *Finnfund* and Norfund provided US$ 10 million debt finance to West African energy provider *Starsight* to enable it to expand its hybrid solar solutions to C&I sectors in Nigeria and Ghana. In February, London-based off-grid utility company *Winch Energy* closed financing for a US$ 16 million clean power mini-grid project in Sierra Leone and Uganda. The project is backed by debt finance from Kenyan project financing company *Sunfunder* and subsidies from the UK and German government for the Sierra Leonean and Ugandan facilities, respectively. In March, Angola received funding for seven solar PV

power plants, including two distributed generators, a 7.99 MW project in Bailundo and a 7.2 MW project in Lucapa. These plants are developed by MCA Group and NEXTracker and financed by SEK, K-sure, and DBSA. In July, West African energy provider *Daystar Power* announced the closing of a US$ 20 million debt facility from the IFC for its expanding distributed generation pipeline in Nigeria. Of this, IFC will be providing US$ 10 million local currency loan from its account and drawing the remaining debt facility balance through a subordinated loan of US$ 10 million from the Canada-IFC Renewable Energy Program for Africa. In the same month, the *Green Climate Fund* (GCF) approved U$ 170 million in financing for the AfDB's Leveraging Energy Access Finance Framework programme. The programme was established to unlock commercial and local-currency financing for distributed renewable energy generators in Ghana, Guinea, Ethiopia, Kenya, Nigeria, and Tunisia. It achieves this by deploying credit enhancement instruments and technical assistance to programme countries.

In addition to the AfDB, the World Bank Group also significantly enhanced the bankability of distributed generators by providing risk mitigation instruments. In June 2021, the Bank supported Burkina Faso's rural solar electrification plans with a U$ 168 million fund. The fund will be employed to implement the country's large-scale solar and rural electrification project and support the government in developing an upcoming tender for 325 MW solar PV with 335 MWh battery storage capacity. The Bank's independent arm MIGA is providing political insurance and credit enhancement guarantees worth around US$37 million to pan-African private energy equity investor *AIIM* for its co-ownership of a distributed generator in Rwanda, Kenya, and the Democratic Republic of the Congo (DRC) for up to 10 years.

Financing has also been committed for several 10 to 75 MW distributed solar and wind generators in South Africa, given the country's regulatory reforms incentivising large-scale distributed generation. The Embedded Generation Investment Programme (EGIP), equally funded by DBSA and GCF, was established in August 2021 to allow companies to compete for up to US$ 10 million from a reserved US$ 200 million fund for distributed generation projects. The EGIP scheme will provide concessional BBBEE funding and enhance the overall bankability of the projects, which unlike the REI4P, offers no government guarantees. Applications are expected to focus on investment-ready projects, including those that were not selected in the REI4P. The EGIP programme is scheduled to mobilise funding from several financiers to enable the emergence of a new market for embedded generation in the country.

C&I tenders

A few MW-scale distributed generation projects are also expected to be financed soon, with various tenders conducted for mainly corporate PPAs. In March 2021, *KTDA Power Company* launched an RFP procedure to select renewable energy companies to develop ten small-sized solar parks for its tea factories, with up to 1 MW capacity. The feasibility studies for the project were supported through a grant from USTDA. In June 2021, the *Malilangwe Trust and Sustainable Agriculture Technology* (MTSAT) issued a tender for companies interested in providing EPC services for a 4.5 MW solar PV plant in Zimbabwe with an option to invest in the project through a BOOT arrangement for 15 years. Investments in renewable energy distributed generation in Zimbabwe, like their grid-connected counterparts, are backed by government subsidies, including a 5-year tax holiday. In July 2021, a tender for 390 MW solar PV with 200 MWh battery storage in the frame of MTSAT's EPC/IPP arrangement was announced by Pan-African company *ARISE Integrated Industrial Platforms* (ARISE IIP) in Togo.

In August 2021, US-based distributed generation investor and developer *CrossBoundary* was selected by Madagascar-based mining company Rio Tinto to develop an 8 MW solar PV, 12 MW wind, and 8.25 MW battery storage capacity hybrid power project on a BOO basis for 20 years. Later in the year, the same developer was also selected by Madagascan mining company *NextSource Materials* to implement a 2.5 MW solar PV with a 1 MWh battery storage project for 20 years. The largest of the distributed generation tenders in SSA in the 2021 period concern a 100 MW solar plant for an Anglo mine in South Africa, benefitting from the recent regulatory changes in the country. A consortium including Pele Green Energy and EDF was selected by the mine owner, *Anglo American Platinum*, to implement the project.

Clean energy dispatchable generation

SSA's energy trilemma is the need to balance affordability, sustainability, and reliability. The increasing deployment of cheap solar and wind power projects, which addresses the first and second aspects of the region's energy trilemma, has been propelled by cost reductions of components, technology advancements to improve capacity factors, favourable policies, and positive public sentiments around zero-carbon energy. However, these power plants' outputs are variable, raising concerns about the need for generators that can quickly dispatch large blocks of clean power to provide grid reliability and stability. To this end, SSA governments, DFIs, and the private sector are beginning to prioritise investments in clean energy dispatchable generators. The rest of this section describes the advancement of these power projects over the course of the year.

Battery energy storage systems

BESSs are expected to complement SSA's increasing generation capacity of variable renewable solar PV and wind to achieve a secure, balanced, reliable, and sustainable power system. The gradual falling cost of BESSs, especially lithium-ion, is making such technologies commercially viable to provide several services to SSA power networks[15]. These systems can be grid-connected or incorporated into a distributed generator; they can be for a long or short duration (i.e. their MWh valuation); and can be co-located with existing or new generation infrastructure or as standalone isolated systems. Either way, BESS could provide diverse value across different regions and market segments crucial for supporting SSA power systems, expected to be dominated by cheap and clean renewable power in the future[16]. As a result, the private sector, governments, and DFIs are exploring the opportunities of implementing BESS.

In grid-connected systems, long-duration BESS (greater than 8 hours) can provide reserve capacity for a secure, reliable, and stable power system. Distributed renewable generators can also benefit from these systems to replace fossil-fuel plants, which currently provide backup power for these generators. Current economics imply that long-duration BESSs are yet to be commercially feasible. This impression has led to the consideration of emerging and relatively clean dispatchable technologies such as gas-fired generators with carbon capture and storage capabilities and low-carbon hydrogen turbines. However, these technologies are new and their technical and commercial viability, especially in SSA, is yet to be exhaustively explored.

[15] See "Cost Projections for Utility-Scale Battery Storage: 2021 Update" by NREL in https://www.nrel.gov/docs/fy21osti/79236.pdf
[16] See "Energy Storage and Distributed Generation" by EPRI in https://www.epri.com/portfolio/programs/053125

Historically, BESS development and implementation in SSA have mainly been for backup power through co-location with distributed renewable generators, in either C&I sectors or residential areas with little or no grid coverage. Several such projects were commissioned in 2021, including in Nigeria, DRC, South Africa, etc.

On the other hand, short-duration BESS, especially for grid-connection, can replace fossil-fuel plants which have been traditionally employed to provide grid stability. These BESSs could provide critical ancillary services to complement wind and solar PV variability, particularly in smaller power systems. Effectively, they would stabilise the grid and guarantee a reliable electricity supply by responding to frequency changes through power absorption and delivery in the order of milliseconds. Poor investment signals, lack of regulatory reforms and incentive regimes, and lack of technical standards in SSA are yet to encourage the development of short-duration BESS.

The appreciation of short-duration BESS, especially those co-located with utility-scale grid-connected renewable generators, is expected to surge as SSA electricity markets become dynamic and highly renewable. For instance, renewable power projects contracted through South Africa's REI4P BW5 will be liable to incur penalties due to errors from forecasts sent to the *System Operator*. However, 2021 saw SSA secure finance for its first three utility-scale grid-connected IPPs with battery storage, the Golomoti project in Malawi, Ambatolampy in Madagascar, and Cuamba in Mozambique. These projects, especially Golomoti and Cuamba, required several grants and concessional loans from DFIs to make the incorporated BESS commercially viable. These development funds from DFIs were critical, considering that BESSs are still nascent and have been sparsely adopted globally. Hopefully, some of the lessons around these projects' development and operation and value to the national grid from an economic and technical perspective can be captured and diffused across the region.

Several short-duration BESS projects, co-located with utility-scale grid-connected generators, are also expected to be financed imminently, with plans for developing such projects announced in Senegal, Kenya, Malawi, Mozambique, South Africa, etc. Some tenders have also been commissioned or completed, including renewable energy projects that feature short-duration BESS. South Africa contracted seven IPPs totalling 578 MW and featuring BESS in its RMI4P tender in March 2021. The 3 x 50 MW Kenhardt solar PV with BESS portfolio, developed by Scatec Solar, is considered the most remarkable project, as it represents SSA's largest wholly renewable-based dispatchable power plant. South Africa's DMRE is also expected to tender 513 MW of battery storage capacity through a BESS-specific tender in 2022. Operational IPPs are considering co-locating BESS to their existing infrastructures. The largest grid-connected wind farm in West Africa, the 158 MW Parc Eolien Taiba N'Diaye farm in Senegal, is expected to host a 40 MW/175 MWh BESS. The feasibility study for the BESS is funded through a US$ 1 million grant from USTDA. The operational Ambohipihaonana solar PV IPP in Madagascar is also on course to be integrated with a 7 MWh BESS.

BESS can be regarded as one of the key technological enablers for accelerating cheap and clean solar and wind power across SSA. Hence, SSA governments must create the right investment signals across the BESS revenue stack so that IPPs are incentivised to invest over a range of market segments, such as capacity, ancillary services, and balancing markets to achieve a secure, reliable, stable, affordable, and sustainable power system. Regulatory reforms and incentive regimes for contracting BESS must be established, such as the globally initiated FiTs, to develop an initial stream of renewable power generation. Supports from DFIs will also remain critical in establishing an initial pipeline of BESS. The safety concerns of BESS, such as thermal runway and the emission of polluting and toxic fumes when overheated, remain a concern for the extensive roll-out of BESS.

Hence, technical regulations and standards guiding planning permissions and environmental and social impact assessments (ESIA) must be well developed, structured, and implemented to build confidence in the sector and ameliorate project risk.

Geothermal power

Geothermal power remains one of the underexploited renewable energy resources in SSA. Geothermal resources for power generation are concentrated in East Africa, particularly the Rift Valley. Countries of the East African Rift region include Comoros, Djibouti, Ethiopia, Kenya, Tanzania, Uganda, and Zambia. Kenya leads the pack as the largest producer of geothermal power, with an installed capacity of over 700 MW (including public and private generators) from a potential of 7 GW, as estimated by the AfDB. This clean and dispatchable generation technology now has a larger share in the country's electricity mix than fossil-fuel plants. Kenya is also home to all geothermal IPPs that are operational or under construction in SSA, beginning with the 13 MW Ormat Olkaria 3 geothermal power plant (OrPower4 phase 1: plant 1) that was funded in 1999. Since then, the country has welcomed six other geothermal IPPs, with total investments of over US$ 450 million. The remaining East African Rift region countries are yet to develop their geothermal resources for power generation as considerably as Kenya. However, 2021 saw some notable developments.

Geothermal exploitation for power generation in SSA received increased support from the private sector, governments, and DFIs in 2021. Such backing is crucial considering the high cost of capital and risk profile of geothermal development. The *Geothermal Risk Mitigation Facility* (GRMF), created by the *African Union Commission* (AUC), *German Federal Ministry for Economic Cooperation and Development* (BMZ), and the EU ITF through KfW to finance and accelerate geothermal development in East Africa, provided development finance for 10 projects in the sixth edition of its grant initiative. These funds will be used to conduct drilling programmes and surface studies for the companies implementing geothermal power projects in the subregion. Immediately after the award of these grants, the seventh round of the initiative was announced. The GRMF grant pool is set to swell following the allocation of a US$ 95 million cash injection from the *European Investment Bank* (EIB) in June 2021.

In March 2021, Djibouti established its *National Geothermal Energy Engineering Company* to develop the country's geothermal power reserves in the long term. However, the country will rely on foreign developers, including IPPs to explore its geothermal resource for power generation in the short term. The 50 MW Assal Rift geothermal PPP in Caldera Fialé is the most advanced geothermal IPP in the country. This project, which has experienced several setbacks since its inception in 2007, has been financially backed by many DFIs, including the World Bank Group, AfDB, AFD, and OPEC Fund. The project received an additional US$ 3.2 million in funding from the AfDB in August 2021. Ethiopia is also exploring geothermal power generation through the private sector in its Tulu Moye and Corbetti sites. The 50 MW Tulu Moye 1 plant developed by a consortium led by Icelandic company *Reykjavik Geothermal* is now near financial close, with drilling works reported to have commenced in 2021. Lastly, Zambia is progressing with its geothermal power ambitions, having received a US$ 3.2 million development loan from REPP for the 19 MW Bweengwa geothermal power project in August 2021.

Low-carbon hydrogen

Low-carbon hydrogen generated from renewables (green) or from gas-fired generators with carbon capture and storage capabilities (blue) can potentially power fuel cells that could reliably, sustainably, and economically generate electricity (and other energies) for domestic and industrial use[17]. Although still in its very early days, low-carbon hydrogen provides an opportunity for SSA to completely decarbonise its economy and serve as an exporter of clean fuel. Exploration of green hydrogen in SSA has currently been championed by Southern African countries: Namibia and South Africa. Namibia is the SSA country with the most advanced green hydrogen project, having awarded SSA's first large-scale green hydrogen production project through an auction programme to Hyphen Hydrogen Energy in November 2021.

South Africa is also well-positioned to produce green hydrogen due to its vast wind and solar renewable energy resources. Within the last quarter of 2021, the country conducted several development studies on the potential of green hydrogen. In July, Sasol and the *Industrial Development Corporation* (IDC) of South Africa agreed to a memorandum of cooperation to co-develop a pathway to accelerate the country's green hydrogen economy. A few months later, Sasol agreed with the *Northern Cape Development Agency* to lead the feasibility study to explore the potential of Boegoebaai in the Northern Cape province as an export location for green hydrogen, to become the country's flagship green hydrogen project. Sasol's development partner IDC will be co-funding the development studies. In October, the *Department of Science and Innovation* commissioned a report identifying three catalytic green hydrogen hubs: Johannesburg, Durban/Richards Bay, and Mogalakwena/Limpopo. These locations were investigated to produce green hydrogen due to their available solar and wind resources and water infrastructure and the possibility for a high concentration of future hydrogen demand. Not too long after, the country's *Council for Scientific and Industrial Research* launched a report commissioned by EU-South Africa Partners for Growth Programme on the near-term decarbonisation potential enabled by the availability of large-scale hydrogen production and export from the Saldanha Bay and Nqura (Coega) ports in the Western and Eastern Cape provinces, respectively.

SSA countries with extensive gas resources, such as Nigeria and Angola etc. can leverage their existing natural and human resources and infrastructure, along with carbon capture and storage technology to provide low-carbon blue hydrogen. There is also scope for natural gas exploration infrastructure to be retrofitted for the production of green hydrogen in the future.

Gas-to-power

Gas-fired generators are not classified as 'clean' due to their emission of methane, a potent greenhouse gas contributing to climate change. However, natural gas has a lower carbon footprint than other traditional fossil fuel sources for power generation, such as Heavy Fuel Oil (HFO), diesel oil, and coal. Data on the construction timelines of utility-scale private generators indicate that gas-fired IPPs are generally built quickly. Further, long-duration BESSs, which offer similar technical attributes as gas-fired generators, are still commercially unfeasible, promoting the case for gas-fired power projects. However, gas-to-power investments remain a contested area, with international funders increasingly under pressure to move away from funding new gas

[17] See "Blue hydrogen as an enabler of green hydrogen: the case of Germany" by the Oxford Institute for Energy Studies in https://www.oxfordenergy.org/wpcms/wp-content/uploads/2020/06/Blue-hydrogen-as-an-enabler-of-green-hydrogen-the-case-of-Germany-NG-159.pdf

capacity. For instance, one of the prominent DFIs in the region, the BII, has discontinued fossil-fuel investments. Therefore, there is a potentially small window of opportunity to fund new gas power, especially for countries with little to no gas infrastructure, such as South Africa. It is also widely debated whether the cost curves of gas power and BESS will cross sooner rather than later, which is a significant consideration given the potentially extensive timelines required to develop gas supply chains and the volatile and surging nature of current global gas prices. Still, some DFIs continue to finance gas power. In 2021, five DFIs jointly provided debt finance to the tune of US$ 495 million for the 450 MW Temane gas-fired IPP in Mozambique. The AfDB, the leading African DFI with an AAA credit rating from all major rating agencies, favours gas and considers it as a transition fuel that can complement the variability of renewable sources such as wind and solar power.

A few countries are also considering retrofitting their HFO-fired generators to gas-based facilities, enabled by technological advancement, and motivated by environmental imperatives and cost-cutting ambitions. For instance, the 120 MW Malicounda IPP under development in Senegal will initially run on HFO but will later be converted to gas once supply from local fields becomes plausible. Novel technologies such as carbon capture and storage systems could also allow natural gas to be exploited for power generation more cleanly~~;~~ However, their technical and commercial viability, particularly in SSA, is yet to be extensively investigated. The pipeline of gas-fired power projects (public and private) expected to reach financial close in Africa before 2030 is more than 16 GW. Hopefully, these new facilities will be incorporated with the burgeoning technologies that could allow for cleaner gas exploitation for power generation.

Run-of-river hydropower

Thirty-nine run-of-river hydropower IPPs (less than 50 MW) have reached financial close in SSA. About a third of these projects were contracted in Uganda through the country's FiT program, launched in 2013. Virtually all of these IPPs had reached financial close in 2018, with the last project closing in 2019. 2021 can be regarded as a year of reawakening for the 'forgotten' generation technology, with committed financing of about US$ 450 million for two new IPPs, Singrobo-Ahouaty in Cote d'Ivoire and Kinguele Aval in Gabon. Both projects also individually doubled the recorded investment for the technology from IPPs in previous years.

Concentrated solar power

All the privately-financed CSP plants in SSA are based in South Africa. Since 2012, seven CSP power projects in the country, totalling 600 MW in generation capacity, have received funding to the tune of US$ 5.4 billion from the private sector. However, the investment outlook for CSP is not promising in the country, as the technology was not included in the latest IRP. Other Southern African countries blessed with immense solar resources are now set to procure CSP from the private sector. Namibia is tendering the region's first CSP IPP outside South Africa. Similarly, Botswana is considering a tender for two 100 MW CSP projects to be procured in 2022.

Transmission capacity

Grid challenges continue to pose a major encumbrance to SSA's electrification agenda. By limiting new investments in generation, including IPPs, grid constraints pose a bottleneck to affordable, reliable, and improved electricity supply in SSA. On a positive note, over US$ 1.5 billion was committed to SSA in 2021 for the maintenance and construction of new transmission capacities that will enable the injection of new grid-connected IPPs.

The earliest transmission investment was a US$ 250 million fund committed by the World Bank Group in February 2021 to improve Angola's electrification rate and electricity sector utilities' operational performance, including enhancing and optimising the evacuation of electricity and the general operation of the national grid. In March 2021, the AfDB financed a 343 km, 400 kV central-south transmission line in the same country to the tune of US$ 530 million to connect the north and south networks. To contextualise the significance of this connection, the North of Angola has an excess capacity of over 1 GW, mainly from renewable generators. At the same time, the South depends on uneconomical diesel-based generators, backstopped by government subsidies.

In April 2021, the EIB provided US$ 368 million funding to support the construction of the 340 km, 225 kV Guinea-Mali power line interconnector. The new network, linking the West of Guinea to the East, will connect two hydropower plants (with a total capacity of 690 MW) and other facilities to the West African Power Pool (WAPP). It will also comprise long-distance grid connections to Côte d'Ivoire, Liberia, Mali, Senegal, Gambia to the West and North, and Sierra Leone to the East and South.

The most noteworthy transmission transaction of the year was a US$ 465 million fund provided by the World Bank Group in June to expand access to grid electricity in the WAPP, amongst other electrification initiatives. In the same month, the AfDB approved US$ 84 million involving loan and grant components to electrify rural households in south Rwanda. The project, which will be providing first-time grid-connections to these homes, involves the construction of 595 km of medium voltage distribution lines and 1620 km of low voltage distribution lines in six districts of southern Rwanda, amongst other upgrading, rehabilitation, and extension initiatives. In July, the Bank also approved two grants worth US$ 83.6 million for the Ethiopia-Djibouti Second Power Interconnection project to propel cross-border electricity trade between Ethiopia and Djibouti. The funds comprise a U$ 69.65 million grant to Ethiopia and a U$ 13.93 million grant to Djibouti. The project enables the development of around 300 km of interconnector lines and 170 km of transmission lines, including the renovation or construction of new substations.

The year wrapped up with the financing of the Temane Transmission Project (TTP) in Mozambique, costing over US$ 500 million. The TTP, part of an overall project including one of SSA's largest privately-owned power plant Temane Gas IPP, is funded and supported by the World Bank Group, AfDB, Islamic Development Bank, Norwegian Trust Fund, OPEC fund, and the DBSA. The project is envisaged to establish a corridor of electrification, ensure a more stable and secure grid, and enable the connection of future renewable generation projects.

Persisting role of DFIs

DFIs, multilateral institutions and bilateral agencies with development mandates, including the World Bank Group, Proparco, US IDFC (formerly OPIC), EAIF, AfDB, EIB, and KfW, remain a principal cog in the development wheel of IPPs. They support IPPs over their project life cycle from feasibility studies to PPA, financial close, construction, and operation. DFIs are reputed to have provided the most support to IPPs in SSA, with 48% of such projects benefitting from either technical assistance, direct concessional finance, credit enhancements, or security arrangements from these institutions. DFIs are also beginning to support new technologies and business models to attract private sector investment. In 2021 they were responsible for providing development loans or grants for feasibility studies, concessional construction loans, and risk mitigation instruments for several clean energy dispatchable and distributed renewable energy generation projects. Further, DFIs are backing the development and expansion of transmission capacity to enable the addition of new utility-scale grid-connected IPPs. In 2021, over US$ 1.5 billion was committed by them, particularly the World Bank Group and AfDB, for the maintenance and construction of new transmission capacity. To this end, the growth of IPPs in SSA will likely remain firmly pegged to the investment and support priorities of DFIs.

About 41% of the total IPP investments in SSA (excluding South Africa) have been contributed by DFIs (see Figure 6), with around 20% of these projects also benefitting from some sort of credit enhancement or risk mitigation package such as payment guarantees, political risk insurance cover, etc. Many of these projects, especially the renewable based-ones, have received grants and development loans from DFIs to enable the completion of their (pre-)feasibility assessments. Between 2001 and 2011, DFIs mainly backed fossil fuel-based IPPs. However, since 2010, their investment preference has shifted to renewable electricity generation (see Figure 7).

FIGURE 6

DFIs contributions to annual IPP investments in SSA (excluding South Africa)

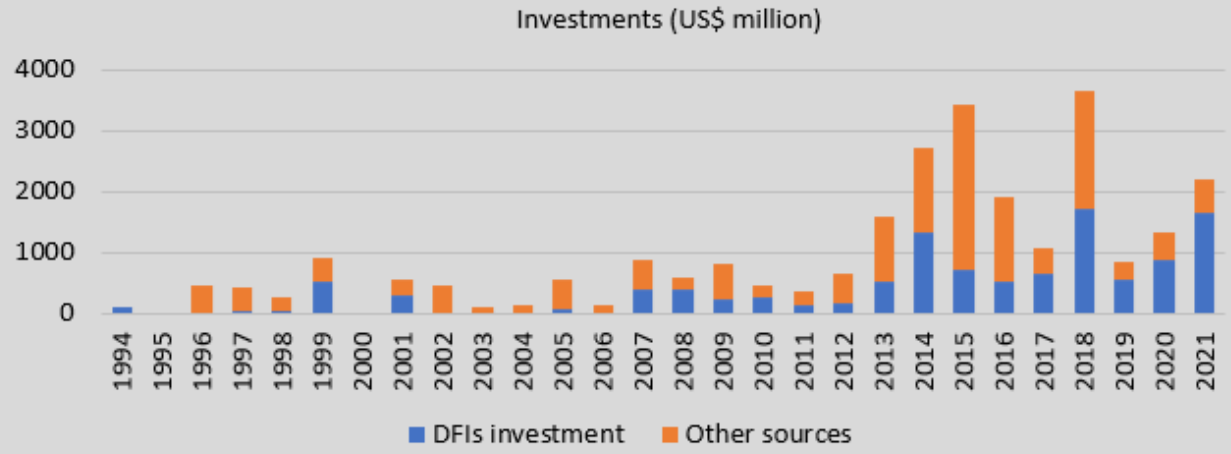
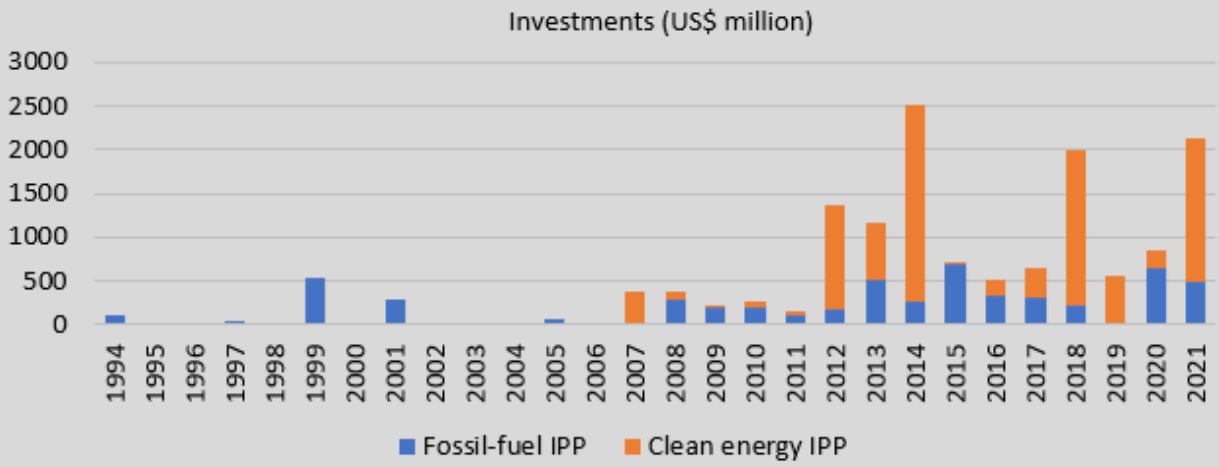


FIGURE 7

DFIs contributions to annual IPP investments in SSA (excluding South Africa)



Note: Clean energy IPPs include large hydropower plants (>50MW)

Around 70% of total IPP investments in 2021 came from more than 15 different DFIs, compared to 65% in the preceding year. The complete funding package from these institutions represented the second most significant contribution from them in a single year. Some of the biggest funders included the EAIF, DFC, Proparco, as well as pan-African institutions, AfDB and AFC. These two African institutions, particularly the AfDB, were together responsible for contributing more than 15% of the total finance provided by DFIs, demonstrating their soaring prominence in the last few years.

A handful of IPPs also benefitted from credit enhancement and security instruments from DFIs. The World Bank Group's MIGA retained its position as one of the largest providers of such support packages. MIGA guarantees to insure private power developers against the risks of currency inconvertibility and transfer restrictions, expropriation, breach of contract, civil unrest, and war. Similarly, the RLSF implemented by ATI and backed by KfW continued its ascent as one of the leading liquidity support facilities for IPPs. Finally, the year saw DFIs significantly promote IPPs employing new technologies and business models. Most of the newly financed IPPs with battery storage benefitted from grants and concessional loans from these institutions to ensure the projects' commercial viability.

PPA renegotiations

The critical role of dynamic and least-cost system expansion planning translated into transparent, predictable, and timely competitive procurement windows to achieve balanced investor and development outcomes and ensure IPP sustainability was reemphasized in 2021.

Kenya and Ghana have persisted in renegotiating existing PPAs with IPPs to lower generation costs to the national utility and consumer tariffs. Both countries' situation is exacerbated by the fact that they are unable to consume or export much of the electricity produced due to constraints within their transmission networks (incl. cross-border interconnectors). One of the main reasons for this dilemma is the absence of proper demand forecasting and planning. Both countries are sitting with several 'take-or-pay' PPA terms with IPPs,

that mandate them to purchase electricity regardless of whether they consume it or not. Ghana is negotiating with IPPs to switch to 'take-and-pay' terms, where the country will only pay for what it consumes for some existing (particularly those contracted under emergency circumstances) and all newly-contracted power projects. Kenya is employing a similar approach; however, it is considering any viable payment structure that would reduce PPA tariffs, including for existing arrangements[18]. These negotiations, if successfully completed and implemented (some deals have already been concluded in Ghana), could lower consumer tariffs and improve the financial health of their national utilities. However, this would negatively impact investor confidence and inhibit a pipeline of future foreign direct power investment, especially for renewable generators that operate on a 'must-run' basis and need to cover their capital costs.

The Kenyan president established a task force to review PPAs in March 2021. The task force undertook a detailed examination of the terms and conditions of agreements previously entered into between IPPs and the state's financially embattled transmission and distribution company, *Kenya Power and Lighting Company*. In July 2021, the task force invited the public for a dialogue on the issue, and in September 2021, the investigation outcomes were presented. Two important recommendations outlined by the task force with significant ramifications for IPP investments in the country include the renegotiation of all existing PPAs with IPPs and the cancellation of all unconcluded negotiations of PPAs. While it is presently uncertain if and when all these recommendations will come into force, the country has now cancelled all pending (ongoing and incomplete) PPAs. Most of Kenya's recent IPPs have been contracted through the country's Renewable Energy FiT (REFiT) scheme. The government notes that future PPAs with IPPs will conform with the country's Least Cost Power Development Plan. However, it is unclear whether these agreements will be through competitive tenders.

While Kenya and Ghana have mandated the renegotiation of PPAs with IPPs, South Africa has taken a more cautious but progressive approach. The country has invited IPPs contracted between REI4P BW 1 and BW3.5 to consider participating in a voluntary refinancing initiative within existing contractual terms[19]. This action has been motivated to lower generation costs in light of the market's maturity. ACWA Power became the first IPP to refinance part of the construction cost of its 50 MW Bokpoort CSP through a US$ 330 million loan from a consortium of six lenders, led by Investec Bank. The lowered tariff resulting from this transaction is expected to save electricity consumers around US$ 50 million over the remaining 13-year term of the PPA. In August 2021, Globeleq became the second IPP to refinance its assets, having attracted over US$ 340 million refinancing loan from ABSA Bank for its project portfolio comprising 2 x 45.6 MW De Aar and Droogfontein 1 solar farms and the 138 MW Jeffreys Bay wind farm. The tariff reductions are anticipated to also save electricity consumers more than US$ 65 million over the remaining 12-year period of the assets' PPAs.

The narrative supporting PPA renegotiations, especially on renewable energies, has been that project developers are benefitting from favourable PPAs to the detriment of utilities and consumers. This notion was due to the falling EPC costs of renewable power experienced in the last decade and SSA's markets that were gradually becoming mature, stable, and experienced with IPPs. However, impacts from the global COVID-19

[18] See "Report of the Presidential Taskforce on the Review of Power Purchase Agreements (PPAS)" by the Republic of Kenya in https://kplc.co.ke/img/full/28102021_210-The-Report-of-the-Presidential-Taskforce-on-PPAs.pdf
[19] See "IPP Procurement Programmes: Evaluation of Seller Refinancing Notices" by IPP Office in https://www.ipp-projects.co.za/PressCentre/GetPressRelease?fileid=ce8018fd-fbc1-ea11-9510-2c59e59ac9cd&fileName=IPP%20REFINANCING%20PROTOCOL.pdf

pandemic, including rising public debt levels, sovereign credit ratings downgrades, supply chain disruptions, conflicts, fragile states, etc. have in many cases resulted in higher project costs (incl. higher cost of capital).

The Djermaya solar PV (with BESS) IPP in Chad, awarded in 2018, would now be more expensive to build as a result of increased panel, steel, logistics, and shipping costs. The Zano and Kodeni solar PV IPPs in Burkina Faso contracted in 2019 have had their EPC costs renegotiated because of the increase in panel and transportation costs and may be further negatively impacted by rising interest rates. These higher prices are also due to increased security risks, worsened by the recent *coup d'état* in the country. For the same reason, the Dedougou solar PV project, awarded as part of the same tender and at the same tariff as Zano and Kodeni, is no longer considered bankable. These latest experiences are leading to fears that many IPPs under advanced development (i.e. with signed PPAs) might no longer be viable. Only time will tell whether these rising input and capital costs are part of a longer-term trend or a short-term blip. In the meantime, developers and their funders are trying to find ways to ensure that projects still go ahead, despite increasing challenges.

Conclusion

This working paper has discussed private power investments and related initiatives enabling these investments in SSA in 2021. Insights from the report demonstrates that despite various challenges, partnerships between governments, development finance institutions, and the private sector can produce significant and sustainable impacts. The report has also corroborated the critical elements for the successful realisation of IPPs, from a country, programme, and project perspective. Some of these factors include the governments' willingness to create an equitable and investment-friendly environment through reforms and incentive regimes, sound policy and integrated least-cost dynamic plan translating to competitive procurement programmes, and provision of technical assistance, financial support, and risk mitigation instruments from DFIs, to crowd-in private power investments.

The importance of government backing for IPP development through regulatory, competitive, and private sector participation reforms and enactment of incentive regimes was spotlighted in Angola and Zimbabwe. The Angolan government's goal of welcoming US$ 18 billion in renewable power investments, mainly from the private sector, by 2025 to diversify its electricity mix has motivated the creation of an enabling environment that has allowed the financing of several solar PV IPPs in the country. The introduction of, and legislative support for, renewable energy through the private sector in Zimbabwe is also unlocking new solar PV IPP investments in the country. The ability of Zimbabwe to attract local and foreign direct investment despite its weak economic and political environment reinforces the critical role of government support in realising IPP investments.

Regulatory, competitive, and private sector participation reforms are also attracting new private power investments in South Africa and Malawi. Regulatory reforms raising the threshold for embedded (self-use) generation and power procurement by local government and the private sector are set to see South Africa welcome several large-scale renewable energy distributed generators imminently. Malawi's and South Africa's experience with IPPs also underlined the importance of structured procurement programmes, particularly auctions, promptly delivering vast power capacity.

DFIs remain critical for increasing IPP investments through directly supporting IPPs or backstopping relatively new technologies and business models to attract private sector investment. Beyond their traditional support for utility-scale grid-connected IPPs, they were responsible for backstopping various other ventures, including dispatchable, distributed renewable energy generation, and grid reinforcement and expansion projects. To this end, the growth of IPPs in SSA will likely remain firmly pegged to the investment and support priorities of DFIs.

Private power investment prospects in 2022 look promising. In 2021, IPP investments experienced an uptick for the first time in three years. This trend is likely to continue as the development of projects suspended in 2020 and parts of 2021 are set to be revived. The vast number of contracted projects from grid-connected IPPs and distributed generators (including those procured before 2021), especially in South Africa, could see investments of more than US$ 6 billion mobilised into the region in 2022. The expansion of the region's grid is also expected to support the addition of these new IPPs.

About Us

Power Futures Lab is a 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 to enhance understanding and build capacity in infrastructure investment, reform, and regulation, in support of sustainable development. Further information is available on our website: https://www.gsb.uct.ac.za/powerfutureslab/

Data sources

The data that informed this report emanated from a collection of electricity sector databases maintained by Power Futures Lab. The data quality of the Lab's databases is underpinned by a data-triangulation approach where data is first collected from secondary data sources – including several scholarly articles, reputable online news sources, and blogs – followed by a verification process using a series of databases such as the World Bank's Private Participation in Infrastructure (PPI) database, African Energy live data, etc. Finally, these data points, where possible, are cross-checked with primary sources, including private and public electricity sector experts, closely involved with the investigated projects. Should readers query the accuracy of any of the data in this working paper or are aware of additional projects not mentioned, we invite you to contact the following Power Futures Lab-linked researchers:

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