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# Africa Current Issues

## Independent Power Producers: A solution for Africa?

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# Independent Power Producers: A solution for Africa?

## Introduction

The African continent experienced unprecedented economic growth over recent decades. As Africa developed, improved nutrition and health care led to higher life expectancy. Coupled with high fertility rates, this resulted in rapid population growth. In sub-Saharan Africa (SSA), life expectancy at birth increased by 11.7 years between 1990 and 2019. The population of the SSA region grew from 490 million to 1.1 billion during this period. The African Development Bank predicts that this number will grow to 2.4 billion by 2050. These people will need access to electrical power.

The UN's Sustainable Development Goal (SDG) 7 seeks to achieve universal access to energy by 2030. We now see progress toward this goal: the number of people without electricity access dropped, from 1.2 billion in 2010 to 840 million by 2017. The UN predicts that by 2030, about 650 million people will still lack access to electricity, with 9 out of 10 of them living in Sub-Saharan Africa.

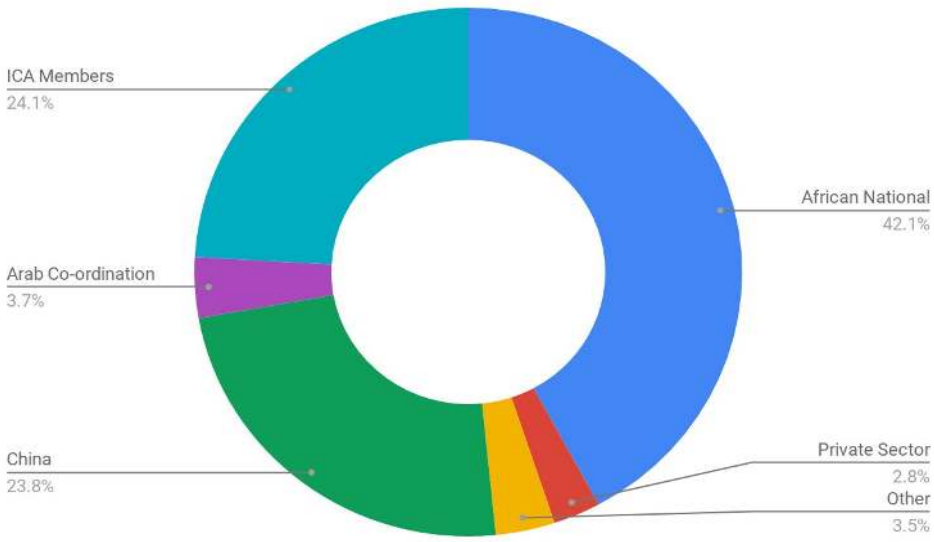
Building this infrastructure requires far more than money. African countries will need technical and managerial capabilities and political will. They will also need financial arrangements that provide the capital needed to meet the needs of their people for electrical power, without imposing debt burdens that cripple their economies. The Independent Power Producer (IPP) model promises to fill this gap.

This paper outlines the current situation in Africa's electrical energy sector, and evaluates the key challenges facing the sector. The author then explores the IPP mechanism as a potential solution to Africa's energy woes, examines the brief history of IPP's in Africa, identifies stakeholder interests and the critical success factors for IPP projects, and proposes a call to action by these stakeholders.

## Africa's Electrical Power Sector

Significant investments in power generation and transmission, combined with institutional reforms in the energy sector, underpin Africa's recent economic growth. In 2017, investment in sub-Saharan Africa (SSA) power projects totalled US$24.7 billion, down from US$28.6 billion in 2013.[1] At 42.1% of the total, SSA governments and their utilities were the largest source of these investments (Chart 1).

*Chart 1: Sources of financing for the Energy Sector in SSA, 2017*

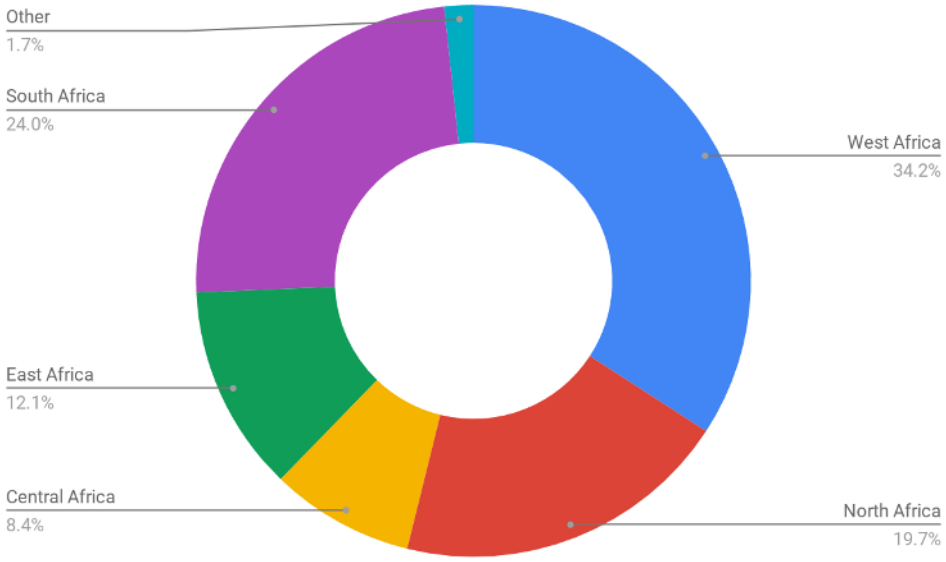



*Source: The Infrastructure Consortium for Africa, 2017*

Note: ICA members include the G8 countries, World Bank Group, African Development Bank Group, European Commission, European Investment bank, and Development Bank of Southern Africa.

The private sector accounted for only 2.8% of all investments during the period, while China - which did not begin investing in the SSA power sector until 2001 - accounted for 23.8%. West Africa dominates the source pool with the largest portion at 34.2% (Chart 2). Arab neighbours, members of the *Infrastructure Consortium for Africa* (ICA) and other donor funds provided the remaining 31.3%.

*Chart 2: Total Energy sector financing by region, 2017*




*Source: The Infrastructure Consortium for Africa, 2017*

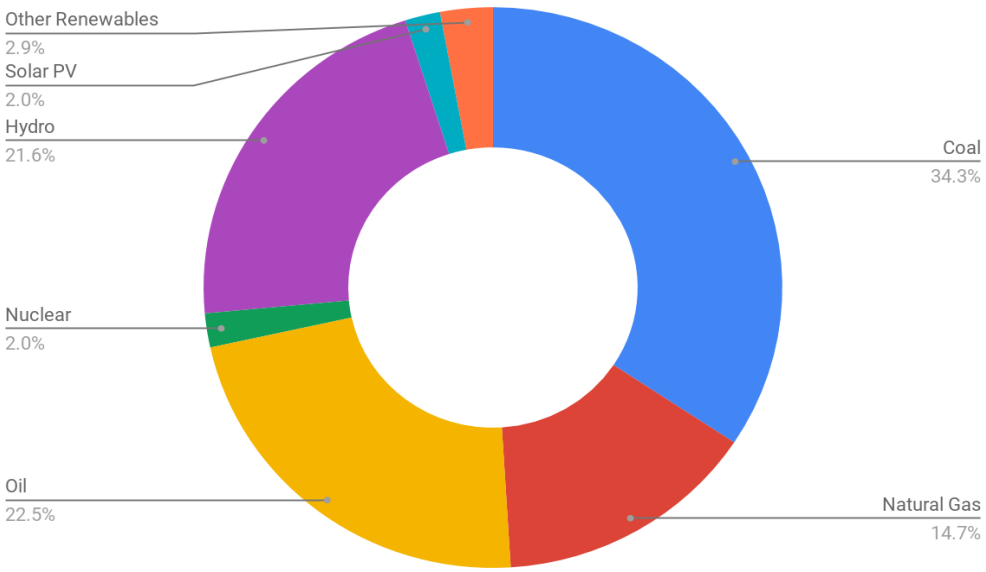
In recent years, growth in demand for electricity in SSA accelerated, driven primarily by economic growth and policies that widened access to power. However, production capacity is little increased since the 1990s.[2] Today, only 30% of the SSA population has access to the electricity grid, compared with 80% worldwide. The low quality and quantity of electricity at their disposal severely disadvantage many African economies. For example power outages cost the economies of Tanzania and Uganda an estimated 4% to 6% of GDP every year. Rural access to electricity is low across the continent.

Underinvestment in transmission, distribution, and collection systems in Africa leads to inefficiencies and unreliability. Electrical energy production losses average 14.8%. The resulting power shortages and high energy tariffs seriously affect manufacturing and smaller businesses. This scenario constrains industrial growth and competitiveness, and leads to losses of another 2–4% of GDP each year.[3]

Consequently, comparison with more developed regions remains stark: power consumption in SSA is 181 kWh per person each year, compared to 6500 kWh in Europe and 13 000 kWh in the United States

alone. Consumption also varies considerably across the continent—South Africa and northern Africa use three-quarters of all Africa's power.

*Chart 3: Sub-Saharan Africa electricity generation mix (2016)*




*Source: International Energy Agency (IEA), World Energy Outlook (WEO), 2017.*

Note: Other renewables include bioenergy, wind, geothermal, concentrating solar power and marine.

On an encouraging note, SSA is incredibly rich in potential power-generation capacity. IEA estimates show 1.2 terawatts of capacity (Chart 3). Including solar, the potential capacity reaches a staggering 10 terawatts or more. This includes potential 400 GW of gas-generated power, with Mozambique, Nigeria and Tanzania alone representing 60% of the total capacity; about 350 GW of hydro, with the Democratic Republic of the Congo (DRC) accounting for 50%; about 300 GW of coal capacity, with Botswana, Mozambique, and South Africa representing 95% of this; and 109 GW of wind capacity, although wind is relatively expensive compared with other sources. Proven geothermal resource potential is only 15 GW, but this technology is important for Ethiopia and Kenya, which hold 80% of the potential.[4]

Industry observers estimate that SSA will need US$40.8 billion a year, equivalent to 6.35% of Africa's gross domestic product (GDP), to address its power needs. This does not include costs for switching to clean and sustainable energy.[5] Approximately two-thirds of the total spend represents capital investment (US$27.9 billion a year) while the remainder covers operations and maintenance costs.

**Key Challenges in SSA's Power Sector**

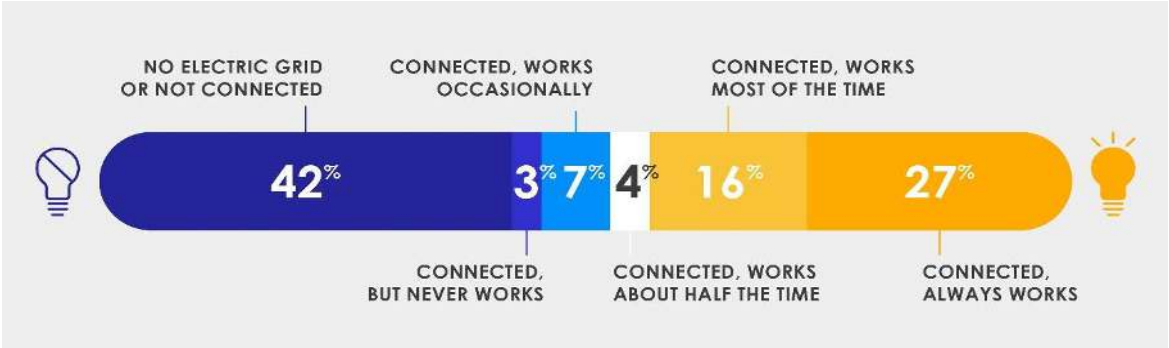
The path to universal energy in SSA access faces multiple barriers. These barriers include insufficient power generation capacity, difficulties in managing energy infrastructure and attracting investments in the sector, and challenges in serving low income-income areas. A large share of the population lacks access to a reliable electricity supply. Population growth, urbanisation, and high ambitions for development will demand even more electrical power. This section sets forth the main energy challenges facing SSA.

Africa's chronic power problems escalated in recent years into a crisis affecting 30 countries. This places a heavy toll on economic growth and productivity. Faced with unreliability and poor access, households and enterprises often rely on expensive diesel power generation to meet their electricity needs. Diesel costs per KWh that range from three to six times that paid by grid consumers across the

world make many Africa-based industries and manufacturing sectors uncompetitive. This scenario slows job growth, and drags annual GDP growth down at least one to three percentage points.

Accessibility is another crucial issue on the continent. A 2019 report by *Afrobarometer* (Chart 4) on Africa's progress toward reliable energy access reports that 42% of households in the 34 African countries surveyed lack grid connections.[6] Access in these African countries varies widely: power is nearly universal and highly reliable in Mauritius, Morocco and Tunisia, while less than three-quarters of households in Burkina Faso, Uganda, Liberia and Madagascar are connected to an electric grid.

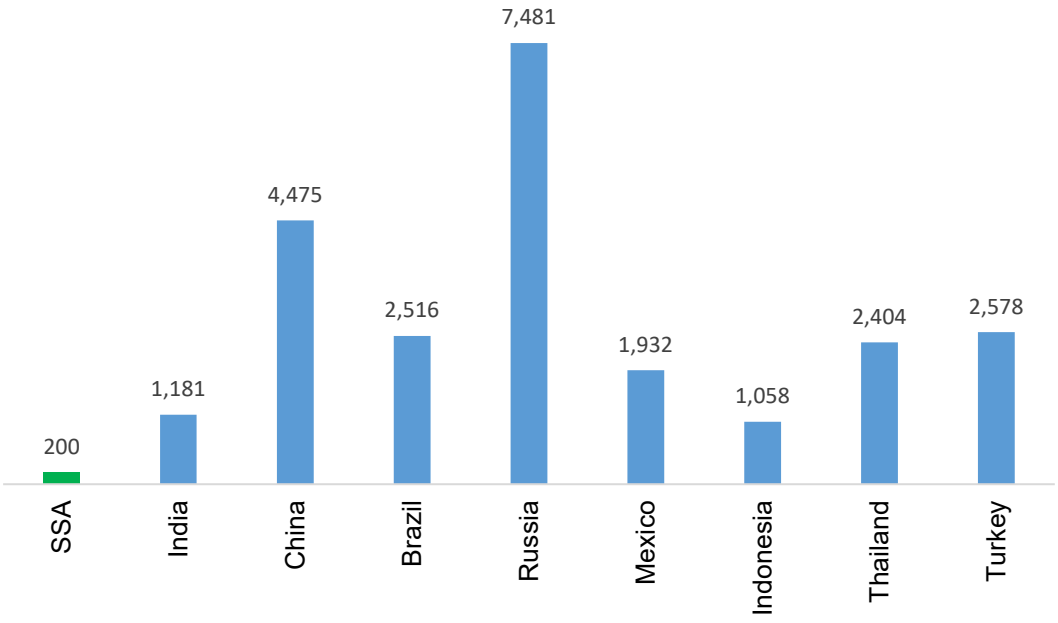
*Chart 4: Africa's Progress Toward Reliable Energy Access*




*Source: Afrobarometer 2019*

Energy efficiency is very low at the industrial, transport and domestic levels. In Kenya, between 10% and 30% of the primary energy input is wasted. Africa's consumption rates are reportedly far below other emerging markets. Average electricity consumption in SSA is only about 200 kilowatt-hours per capita (Chart 5), according to the World Fact Book. This is a fraction of consumption rates in Brazil, India, and China. Artificially low tariffs for electricity across much of the region pose an entirely different challenge.[7]

*Chart 5: SSA's power consumption compared to emerging markets. (Kilowatt-hours/capita), 2016*




*Source: The World Factbook, 2016*

African nations that have electrification rates of less than 80%, yet have GDP per capita greater than US$3,500 tend to be those with significant wealth in natural resources, such as Angola, Botswana, and Gabon. But even they fall well short of economic prosperity.

Presently, Africa faces a new set of threats brought about by the Covid-19 pandemic. It seems highly probable that financial resources once destined for major infrastructure developments may now be redirected towards healthcare or shoring up government budgets. Similarly, as cash-strapped foreign investors may also become more risk averse, the cost of borrowing at the state level may go up. Some credit ratings agencies downgraded the debt of those African countries most affected by the pandemic, such as South Africa. A few countries (such as Ghana) temporarily subsidised electricity to help the poorest weather the crisis. For many Africans, paying power bills is likely to be a struggle for some time.

**Independent power producers (IPPs): a solution for SSA's power problems?**

Currently, close to 600 million Sub-Saharan Africana live without electricity access, underlining the reality that the region simply does not generate enough power to meet its needs. Given that Africa's power sector needs far exceed already stretched public finances, it is crucial for governments to attract greater levels of private investment to scale up generation capacity and help distribute electricity to those who need it most. This is where IPPs are essential to electricity in SSA. This section evaluates their history, important roles played by IPPs in SSA to date, and the factors needed to spur their growth in the future.

a. Rise of IPPs

IPPs are hardly new to the region. The first was the Ciprel Power Plant, built in 1994 in Cote d' Ivoire.[8] IPPs completed 4.8 gigawatts (GW) in new SSA generation projects between 1990 and 2013, comprising nearly one-fifth (US$7 billion) of the value of all new generation during that period. Since 2013, IPPs have completed an additional 6 GW in generation, reaching a total of 11 GW for the time span between 1990 and 2016. IPP-invested generation projects have been constructed in 18 SSA countries, with 43% of the investments concentrated in South Africa.

*Table 1: Largest IPP investments in SSA electricity generation projects, 1994-2014*

| Project | Country | Investment (Mn US$) | Capacity (MW) |
|---|---|---|---|
| Afam | Nigeria | 540 | 630 |
| Okpai | Nigeria | 462 | 480 |
| Azito | Cote d'Ivoire | 430 | 434 |
| Kpone IPP | Ghana | 900 | 350 |
| Takoradi 11 | Ghana | 440 | 330 |
| Lake Turkana Wind Power | Kenya | 861 | 300 |
| Bujagali Hydro Project | Uganda | 860 | 250 |
| Aba Integrated | Nigeria | 460 | 141 |

*Source: Eberhard et al., Independent Power Projects in SSA, 2016, 25*

While South Africa is the largest market for completed as well as uncompleted IPP projects, most of the largest individual projects, in terms of funding size, have been in three West African countries: Ghana, Nigeria, and Côte d'Ivoire. In terms of capacity, the largest IPP investments are in the Nigerian power sector: the Afam project (gas), which will add 630 MW of installed capacity, and the Okpai project (gas),

which will add 480 MW (Table 1). In the East side of Africa, large IPP invested projects include an US$861 million, 300 MW wind power facility on Lake Turkana in Kenya, and a hydropower facility in Uganda amounted to US$860 million to add 250 MW.

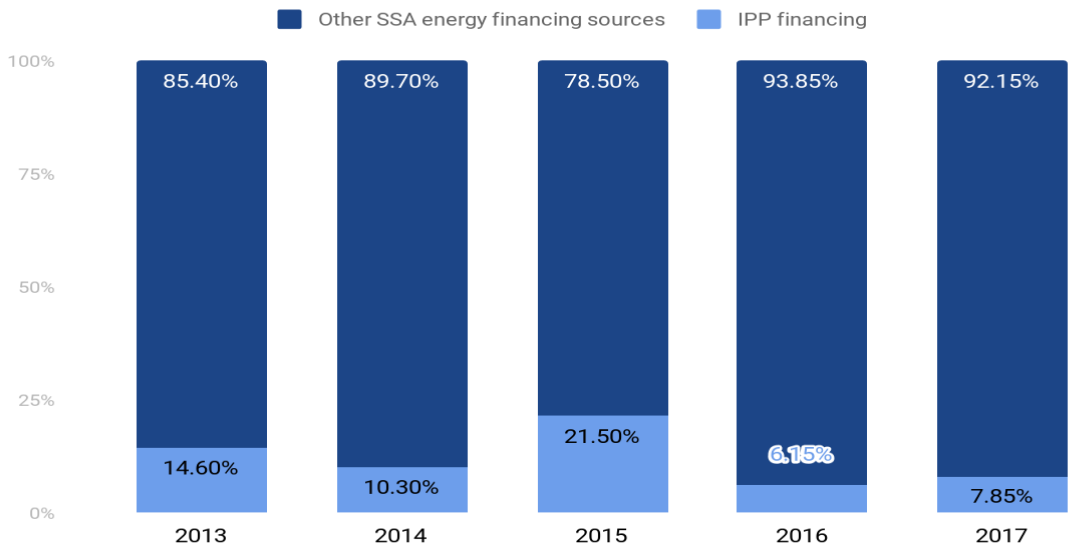
African IPPs vary in structure. While the typical IPP structure is understood as a privately sponsored project with nonrecourse or limited recourse project financing, IPPs in SSA do not always follow this model. Instead, governments typically hold a portion of equity or debt, bringing IPPs closer to a model of a public-private partnership (PPP) than that of a more traditionally conceived IPP. This can have benefits for investors, in that it potentially mitigates some of the inherent risk of investing in a developing country.

b. Why IPPs are Crucial

IPPs are crucial in part because of the challenges existing legacy power companies face in amassing capital and financing new projects in the continent. State-owned companies - particularly those involved in distribution and transmission - have long struggled to keep up with funding demands. This is one of the forces driving the trend to unbundle activities, privatise state assets and seek outside investment. In addition, many utilities are still saddled with sizable debts and reliant on the sovereign to bail them out – putting them beyond most commercial lenders' comfort zones. The result: investment in utility-scale generation and transmission infrastructure remains lower in Africa than for any other global region.

Moreover, investments in the power sector in Africa come mostly from governments or public utilities (with foreign aid support). Unfortunately, these sources of funding are often unstable. Commitment to Africa's energy sector declined over the five years ending in 2017. The Infrastructure Consortium for Africa (2017) report shows a considerable decline in energy financing, from US$28 billion in 2013 to US$24.7 billion in 2017. In percentage terms, the IPP portion of the total energy financing to the region suffers the same trend (Chart 6).

*Chart 6: Total Energy Sector Financing by Source, 2013 - 2017*




*Source: Infrastructure Financing Trends in Africa - 2017*

c. Success factors for IPPs

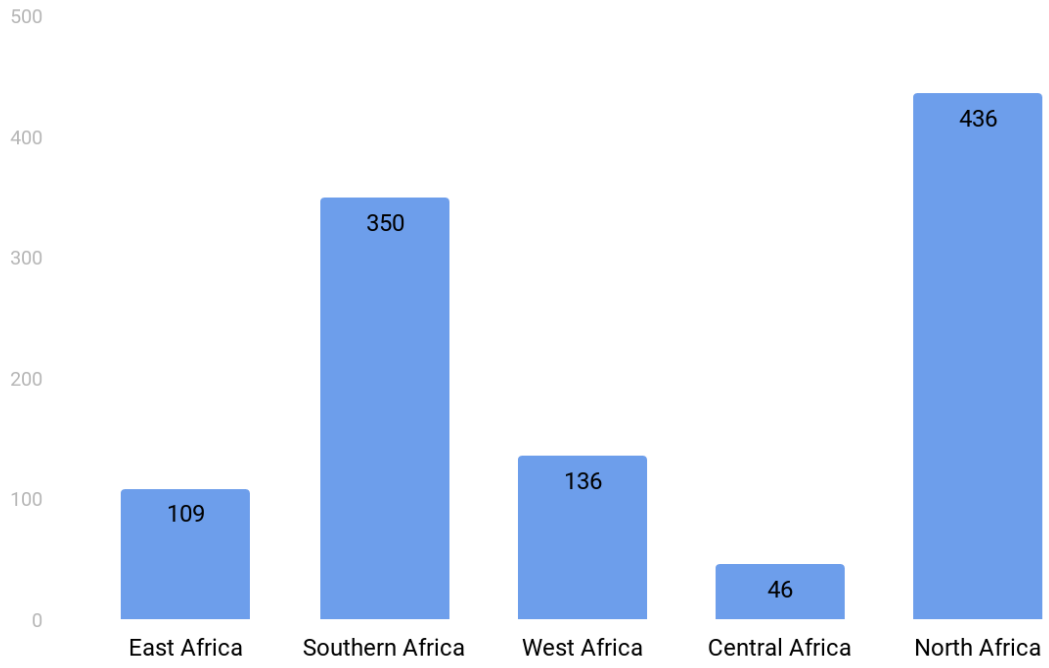
High economic growth is one key factor that attracts investors. Rising demand, driven by population growth, increasing numbers crossing the line from subsistence to consumerism, and affordable rates, is a related factor. The final success factor is access to supply, and Africa's vast untapped renewable

energy resources promise to provide power for all at an affordable cost. Researchers report other factors that are critical to the success of an IPP. These include a favourable investment climate and terms, clear policy and regulatory frameworks, careful selection of partners, and adequate security arrangements.

i. Projected High Economic Growth

In Eastern Africa, the economic engines of Ethiopia and Kenya drive forecasted GDP growth. AfDB expects the region to see the highest demand growth of the five regions up to 2025, with an 11.1 % CAGR in demand. Similarly, Northern Africa, which now has near universal access, would see a 5.6% CAGR in demand up to 2025. This stems mainly from GDP growth. AfDB forecasts indicate that Egypt will continue to dominate demand in the region, accounting for more than 60% of the total by 2030.

*Chart 7: 2025 net Electricity Demand Projections (TWh/year)*




*Source: Africa Development Bank (Estimating Investment Needs for the Power Sector in Africa 2016-2025)*

According to the International Energy Agency (IEA), By 2030, commercial and industrial energy demand in SSA (about 760 terawatt-hours) is expected to be similar to that of Japan in 2010 (702 terawatt-hours). By 2040, the region's commercial and industrial energy demand (1,107 terawatt-hours) is expected to reach half of that consumed by the European Union in 2010 (2,275 terawatt-hours). The AfDB expects net demand for electricity to rise to 1,000 TWh per annum. North Africa will account for the largest portion at 436 TWh/year or 40% (Chart 7).

ii. Population growth and low electricity rates

Africa's population is also booming faster than anywhere in the world; it is expected to almost quadruple by 2100. This is by far the largest increase projected amongst the different continents – from just shy of 1.2 billion currently to 3.9 billion. Other studies reveal that more than half of global population growth between now and 2050 will occur in Africa.[9] This growth is expected to add to energy demand. Currently, more than half the African population lacks electricity. More importantly, as a result of high urbanisation rates, the proportion of people living in cities in sub-Saharan Africa is set to increase to more than 50% by 2040, compared to 38% in 2010.

Low electricity access rates in the region link closely to income levels and population growth. Electricity access data varies widely depending on the reporting sources; IEA reports average rates ranging from 70% to over 94% in Northern Africa, and 25% in sub-Saharan Africa, with large disparities between countries (for instance less than 5% in Uganda, Chad and Sierra Leone compared to 66% in South Africa or 100% in Mauritius), and between urban and rural areas. In the latter, access rates may be as low as 1% according to the African Development Bank.

iii. Untapped Renewable Energy resources

Africa is endowed with vast untapped renewable energy resources that promise to provide electricity for all at an affordable cost. Researchers now report that potential solar and wind power on the continent is far greater than previously thought—as much as 3,700 times the current total consumption of electricity. These factors, combined with falling hardware costs, drive the surging interest in green power. The International Renewable Energy Agency (IRENA) notes that Africa could harvest absolutely massive amounts of green energy. IRENA research, which synthesized 6 regional studies, identified the potential for 300,000 gigawatts (GW) of solar photovoltaic (PV) generation capacity.[10]

The report further shows that for most African countries, the potential ranges from a few thousand GW up to tens of thousands GW. On wind, IRENA reports that the total technical wind potential is above 7,000 GW. Notably, all but a few African countries are endowed with lower quality wind potential (capacity factors ranging from 20-40%), adding additional wind generation potential of more than 250,000 GW. Africa's hydro potential is also vast, though very capital-intensive.

Power production economics are shifting rapidly. Renewable power technologies now compete head-to-head with fossil fuel generation without subsidies. Increasingly, renewables can undercut fossil sources, often by a substantial margin. As upfront costs for renewable energy continue to fall, renewable power becomes the default least-cost source for electrical power. More mature renewable sources, such as hydropower, bioenergy and geothermal, can compete with fossil-based sources, even at low oil prices. As renewable resources become more widely available, they provide IPPs with new opportunities to explore and invest in potentially affordable and secure energy supplies.

**Action Plan**

Public and utility financing has traditionally been the largest source of investment in power generation in sub-Saharan Africa. Today, independent power projects are growing rapidly. Their need for investments in capacity is obvious, especially in the face of robust economic growth on the continent, which has been the key driver of electricity demand over the past several years. Moreover, the revolution in renewable energy technologies such as wind and solar energy, offering declining costs and improved efficiencies, suggests that IPPs focused both on the grid-based and off-grid sectors would be viable in SSA.

a. More IPP Financing

Lack of access to funding is the main reason why SSA has only one-quarter of the investment it needs to sustain its electricity sector. This suggests that large funding gaps for new power projects cannot be left to governments.[11] Funding for electricity capital expenditure in Africa is about US$4.6 billion a year, of which public sources contribute about 50%. This highlights the urgent need for increased private investment, including public-private partnerships.[12] In 2015, McKinsey estimated that SSA would need to spend US$490 billion by 2040 to build new electricity generation infrastructure (or between US$20 to US$25 billion annually).[13] The World Bank projection was even higher: the SSA power sector must invest US$33.4 to US$63 billion annually between 2015 and 2040 to meet rising demand.[14]

From another perspective, the African Development Bank (AfDB) estimates that increasing sustainable generation capacity by 2030 will require between US$44-69bn of annual financing. Most of this would go for renewable generation. Transforming Africa's energy to meet nearly a quarter of its energy needs from indigenous and clean renewable energy by 2030 will require an average annual investment of

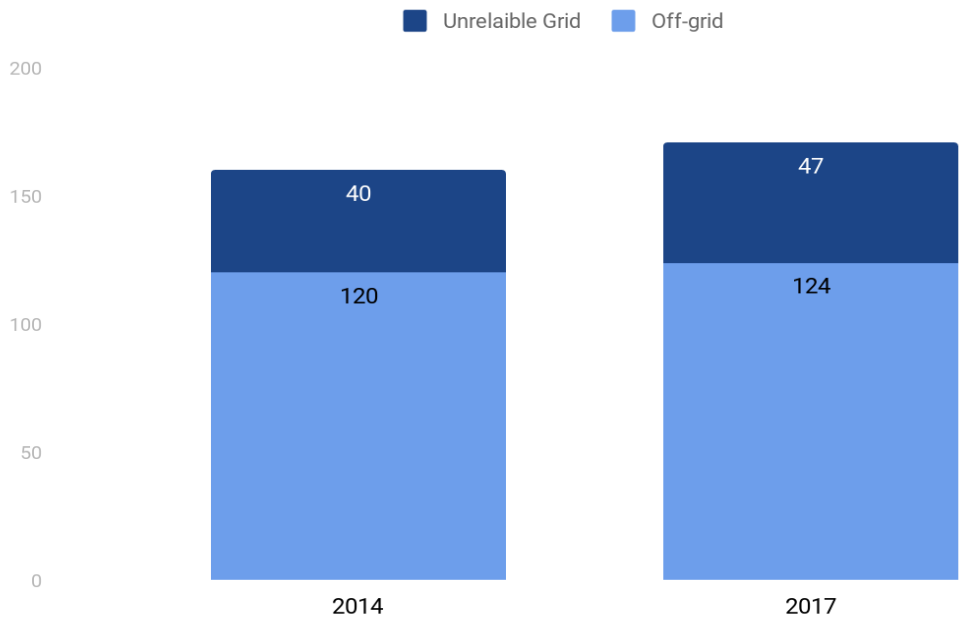
US$70bn according to the International Renewable Energy Agency's (IRENA) 2019 *Scaling Up Renewable Energy Development in Africa*. This would reduce the region's carbon-dioxide emissions by up to 310 megatonnes per annum.[15]

While costly, these improvements are critical to the region's economic development. Two-thirds of respondents in a PwC survey; *A New Africa Energy World* (2015) of SSA-based businesses cited "ageing or badly maintained infrastructure" in the power sector as a challenge to their businesses over the next five years.[16] With this huge financing need, IPP funding support can help bridge the funding gap. International renewable energy funding organisations have an opportunity to partner with IPPs on the ground. Development-focused organisations including Development Financing Institutions (DFIs) like Proparco, FMO and DEG, will be increasingly important in bringing new IPPs in SSA. At the government level, factors such as favourable investment climate, clear policy and regulatory framework, are critical.

b. Off-Grid Solutions

IPP-driven off-grid solutions are also expected to play an important role. AfDB notes that while Africa will add nearly 190 million new on-grid, mini-grid, and off-grid connections by 2025, off-grid connections are expected to add another 75 million - 20 times that of today. This ambitious expansion program would provide all 408 million households in Africa with access to electricity by 2030. A large portion of formerly off-grid populations recently connected to the national grid still receives inadequate power, which presents off-grid players and tech-and-hardware suppliers an economic opportunity. The World Bank's Lighting Africa report estimates that 170 million households are suitable for the off-grid market (Chart 8).

*Chart 8: Sub-Saharan Potential Market, Millions households (2014-17 est.)*




*Source: World Bank (Lighting Africa 2010 Report)*

c. Stakeholder interests

The reality of Africa's energy challenge is that unless adequate financing is available, much of the continent will remain dark. The bright notes are the rapidly decreasing cost per KWh of renewable sources, and the rising adoption of off-grid sources of power that require little capital investment. If the

stakeholders can adapt the IPP mechanism to embrace these increasingly affordable renewable sources of electrical energy, everyone comes out a winner. State-linked power producers need not confront the impossible task of raising capital to expand their national grids. Households in presently underserved areas will have access to electricity, perhaps at first from small-scale sources, then from local grids. Business owners, especially manufacturers, will gain increased energy security. Governments will not face crippling debt burdens. Investors will gain access to new opportunities.

It's worth noting that since the World Bank published the Lighting Africa report in 2010, the global off-grid sector has seen this market evolve and expand substantially. By 2017, sales of over 130 million devices were registered, penetrating approximately 17% of the global potential market, and generating 3.9 billion in cumulative revenue. It's important that private sector players such as engineering, procurement and construction (EPC) contractors ensure that IPP projects in SSA embrace the new technologies in the off-grid sector. This shift increasingly makes financial sense. According to IRENA, renewable energy is now in a virtuous cycle of falling costs, increasing deployment and accelerating technological progress. Over the past decade, solar PV module prices dropped by about 90%, and wind turbine prices fell by 55-60%.[17]

**Conclusion**

While closing the gap on Africa's energy faces many challenges, it also presents investors with major new opportunities. The continent needs US$90 billion to achieve universal energy access by 2030. Its financing needs are of such magnitude that no single institution is capable of meeting them in isolation. IPP partnerships will be crucial in mobilizing private sector financing at scale. Previous IPP sub-sector success in South Africa, Nigeria and elsewhere demonstrates the potential for private sector involvement across the continent. To date, IPPs have contributed significantly to meeting Africa's power needs. However, the scale of financing must rise. Rising demand, failing infrastructure and untapped potential for electricity generation in SSA generate substantial needs for much more IPP investment in the region.

Equally important, the challenge of overcoming the continent's power deficit requires African countries to create the conditions that will attract more IPPs. Presently, multiple barriers hinder energy investments and private sector participation. Lowering these could fast-track energy access. They include lack of enabling policy environments for investors and systemic bottlenecks that slow transactions and escalate project costs. Transforming the energy landscape calls for a multi-faceted approach to unlock private sector capital by resolving these barriers to create the ideal conditions for investments in the continent.

Africa's governments will need to prioritize reform efforts, keep an eye on the long term, and focus on developing the regulations and capabilities needed for the sector to thrive, not just on hardware such as the power plants and associated infrastructure. They must also court investment partners carefully, and ensure terms that align the interests of the public with those of investors.

In time, universal access to energy will support attainment of better health and education outcomes, reduce the cost of doing business, unlock economic potential and create new jobs. The IPP model can help achieve energy access for all in the continent, and must be seen as a key driver of inclusive growth.

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Editor: Dr. A. Lee Gilbert
Editor-in-chief: Prof. Sam Park

## References

[1] Infrastructure Consortium for Africa's (ICA's) Secretariat, (2018), *Infrastructure Financing Trends in Africa - 2017,* https://www.icafrica.org/fileadmin/documents/Annual_Reports/IFT2017.pdf

[2] Proparco - Private Sector and Development, (March, 2017 issue), *Special Issue: Independent Power Producers: A Solution for Africa?* https://www.proparco.fr/en/ressources/special-issue-independent-power-producers-solution-africa

[3] Africa Development bank AfDB), Annual Development Effectiveness Review, (2017), *Light Up and Power Africa* https://www.afdb.org/fileadmin/uploads/afdb/Documents/Development_Effectiveness_Review_2017/ADER_2017__En__Ch._2.pdf

[4] Eberhard, Anton, *(2015), Powering Africa: Facing the Financing and reform Challenges.* https://www.cairn.info/revue-d-economie-du-developpement-2015-HS-page-39.htm

[5] Tralac, (14th April, 2016), *Independent Power Projects in sub-Saharan Africa: Lessons from five key countries.* https://www.tralac.org/news/article/9468-independent-power-projects-in-sub-saharan-africa-lessons-from-five-key-countries.html#:~:text=The%20cost%20of%20addressing%20the,gross%20domestic%20product%20(GDP).&text=Historically%2C%20most%20private%20sector%20financing,independent%20power%20projects%20(IPPs).

[6] Madden, Payce, (Thursday, December 12, 2019), *Figure of the Week: Progress toward reliable energy access in Africa.* https://www.brookings.edu/blog/africa-in-focus/2019/12/12/figure-of-the-week-progress-toward-reliable-energy-access-in-africa/

[7] Wikipedia https://en.wikipedia.org/wiki/List_of_countries_by_electricity_consumption

[8] Oxford Business Group, *Governments in Cote d'Ivoire and Africa turn to independent power producers to create much-needed generation capacity,* https://oxfordbusinessgroup.com/analysis/independence-day-governments-are-turning-independent-power-producers-ipps-create-much-needed

[9] United Nations; Department of Economic and Social Affairs, (2019), *World Population Prospects 2019* https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf

[10] Saadi, Nwafal and Miketa, Asami, International Renewable Energy Agency, (2015), *Africa Power Sector: Planning and Prospects for Renewable energy.* https://www.irena.org/documentdownloads/Publications/IRENA_Africa_Power_Sector_synethesis_2015.pdf

[11] Foster and Briceño-Garmendia, *Africa's Infrastructure: A Time for Transformation"* 2010.

[12] The Committee of Ten Policy Briefs, African Development Bank, (2010), *Financing of Sustainable Energy Solutions.* https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/C-10%20Note%203%20English%20%28final%29_for%20posting.pdf

[13] Castellano Antoni et Al, (February 2015), *Brighter Africa; The Growth Potential of the sub-Saharan electricity Sector.* https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/east%20africa%20the%20next%20hub%20for%20apparel%20sourcing/brighter_africa_the_growth_potential_of_the_sub%20saharan_electricity_sector.pdf

[14] World Bank, (2017), *Linking Up: Public-Private Partnerships in Power Transmission in Africa.* https://openknowledge.worldbank.org/bitstream/handle/10986/26842/LinkingUp.pdf?sequence=3&isAllowed=y

[15] International Renewable Energy Agency (IRENA), (January 2019), *Scaling Up Renewable Energy Development in Africa.* https://www.irena.org/-/media/Files/IRENA/Agency/Regional-Group/Africa/IRENA_Africa_impact_2019.pdf?la=en&hash=EECD0F6E8195698842965E63841284997097D9AA

[16] PwC; Power & Utilities Sector Survey: Kenya Edition, (July 2015), *A New Africa Energy World: A More Positive Power Sector Outlook,* https://www.pwc.com/ke/en/assets/pdf/a-new-africa-energy-world.pdf

[17] IRENA, Data, research and resources on renewable energy costs, https://www.irena.org/costs

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## Nanyang Centre for Emerging Markets

The Nanyang Centre for Emerging Markets (CEM) is a new initiative by Nanyang Business School to establish global thought leadership on business-related issues in emerging markets. It conducts research on pressing and timely business issues in emerging markets through a global research platform of leading scholars and institutional partners. It closely interacts with corporate partners to identify research topics and manage the research process. Its research outputs include valuable and relevant implications for sustained profitable growth for local and multinational companies in emerging markets. It delivers a variety of research reports and organizes forums, seminars, CEO roundtables, conferences, and executive training programmes for broad dissemination of its research outputs.
http://www.nbs.ntu.edu.sg/Research/ResearchCentres/CEM

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