Sun Africa

Renewable energy solutions

About Us

Sun Africa is a joint venture between an established U.S. based utility-scale solar developer, Urban Green Technologies, and Persoil IS, an established company that brings experience and in-depth knowledge of the region. Sun Africa offers comprehensive solutions to develop solar projects and renewable energy strategies. As a leading utility-scale solar project developer and off-grid solution provider, Sun Africa is redefining what it means to be a clean energy company. Our mission is to help the world meet its energy needs sustainably.

With technology expertise, supply chain capabilities, and access to capital, Sun Africa and its partners deliver projects with low cost and high efficiency. Working with the largest energy engineering, procurement, and construction companies (EPC), Sun Africa maximizes economic value by selecting optimal electrical generating components, negotiating local contracts, maintaining, and real-time monitoring the project site.

Our Approach

Sun Africa's core competencies include:

- Developing projects, including site selection, project engineering and design, interconnection, permitting, incentive procurement, negotiation and execution of project documents
- Providing development capital for pre-construction activities
- Providing capital for project construction and long-term ownership
- Providing due diligence for third party projects or projects that are at various stages of development for outside investors

Sun Africa adopts a phased-approach in developing solar projects:

- The **pre-construction** phase will include carrying out land surveying, power plant design review with reference to the highest industry standards; planning for storm water drainage and containment, undertaking site preparation, manufacturing-**procurement** of items and transporting the required components and construction equipment to site
- The **construction phase** will include establishment of internal and external access roads; establishment of construction areas; construction of the entire solar array, construction of the power substation or other onsite structures) and other ancillary infrastructure (i.e. power-line for evacuation of electricity); and interconnection of the solar plant substation to the national electricity utility grid
- The **post-construction phase** will include plant operation and maintenance, site remediation, clearance and deposition of debris off the site, restoration of areas where construction activities temporarily disturbed the environment, repairs and replacements of failed parts; and finally decommissioning the entire plant when the useful life of the facilities is over

Figure 1. Project Process Map

Analysis

- Ascertain reliable solar relation to land, rooftop or field source area to predict annual performance
- Proximity studies to the nearest grid
- Review of necessary permits
- Financial assessment

Design

- Detailed implementation planning
- Budget Development Land lease options
- Landowner & stakeholder agreements
- PPA negotiated or Feed-In-Tariff secured

Build

- Procurement (RFP/RFQ)
- Selection and tendering to subcontractors
- Logistics
- Construction supervision
- Quality control and final inspections

Manage

- Real time site monitoring
- Verify performance output
- Provide site security
- Perform periodic maintenance
- Perform necessary repairs
- Monitor warranty terms

Energizing Nigeria

The energy demand in Nigeria will increase as the Nigerian population and urbanization continue to expand. McKinsey, a consultancy, estimates that by 2040 Sub-Saharan Africa will consume as much electricity as India and Latin America combined in 2010 (See Figure 2).[1]

Figure 2. Projected vs. Current Electricity Consumption

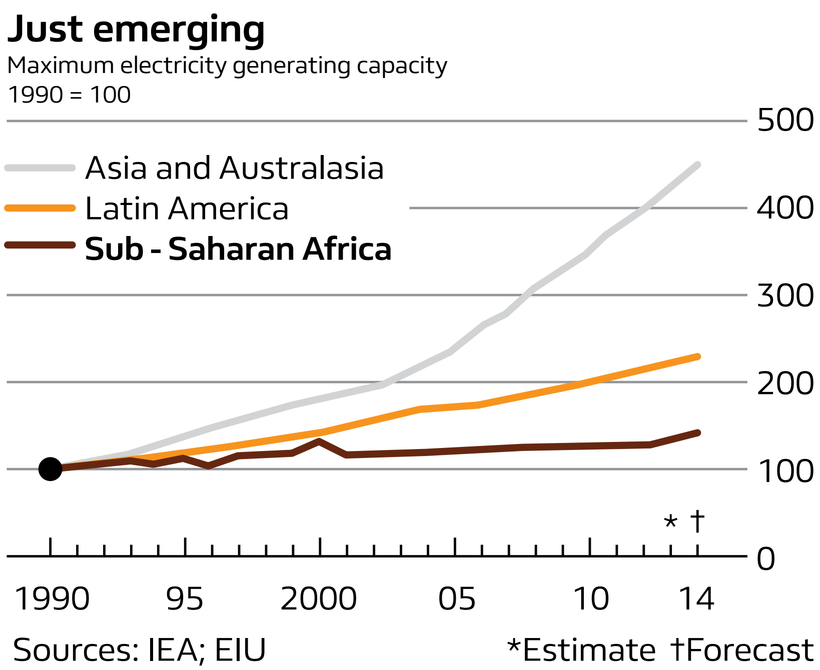
	Electricity consumption 2010, terawatt - hours p.a.	**Consumption/capita,** kilowatt - hours
United States	3,952	13,395
China	3,557	2,944
European Union	3,035	6,264
Sub - Saharan Africa 2040	**1,570**	**989**
Japan	996	8,394
Latin America	841	1,951
India	760	625
Canada	522	15,137
Brazil	426	2,381
Sub Saharan Africa	**423**	**514**

Source: Key World Energy Statistics, Organisation for Economic Co-operation and Development and the International Energy Agency, 2013, iss.org; World Development Indication, World Bank Group, worldbank.org

[1] *Antonio Castellano et al, Brighter Africa: The growth potential of the sub-Saharan electricity sector (McKinsey & Company, 2015), 3*

Despite the surging demand, the supply of electricity has been stagnating. Only 32% of the population in the Sub-Saharan region has access to electricity – this is roughly the same as the U.S. in 1920 and the U.K. in 1929 – and progress has been slow.[2] For example, in the decade between 2000 and 2010, generation capacity in Sub-Saharan Africa increased by a total of 6,000MW. Whereas in China, the total electricity capacity increased by 8,000MW every month in 2010.[3] This gap will continue to widen if measures are not taken to introduce new energy supplies (See Figure 3).[4]

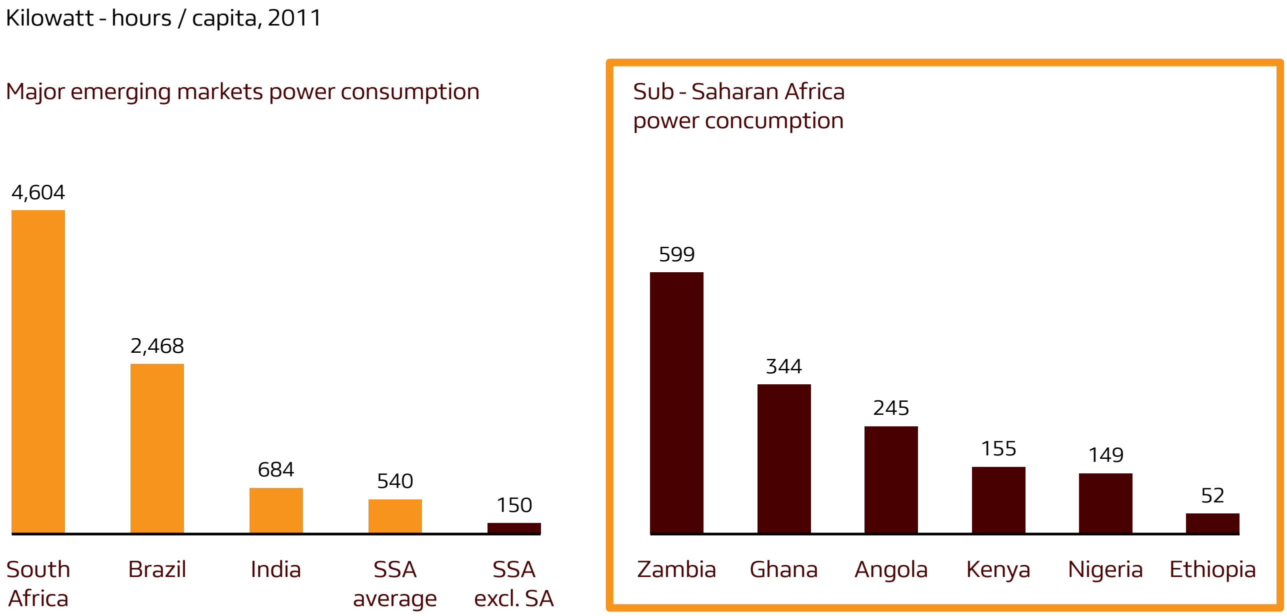
Figure 3. Electricity Generating Capacity by Regions



[2] *The Fourteenth United States Census , www.census.gov; and Hannah, L, Electricity Before Nationalisation, John Hopkins University Press, 1979.*
[3] *US EIA Historical Statistics for 1980-2010.*
[4] *Economist, Lighting a Dark Continent (Economist, 2014).*

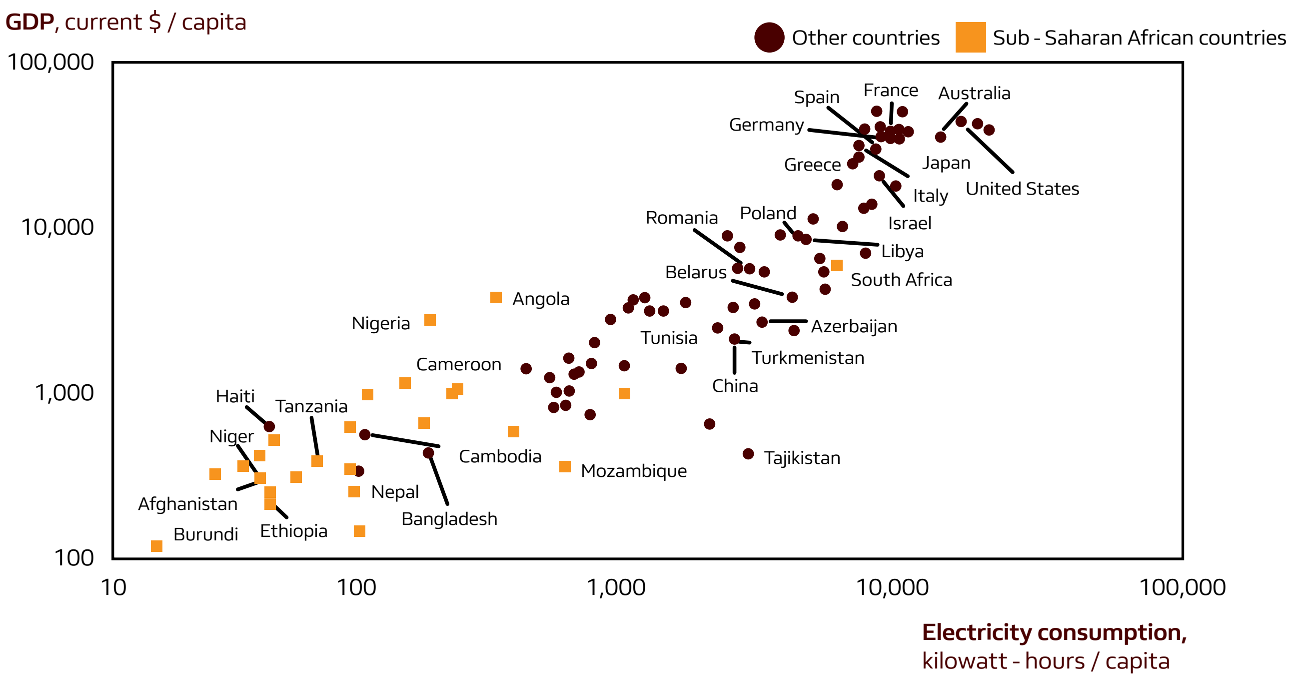
The supply shortage is especially acute in Nigeria. It has a population three times larger than South Africa's, but generates just a tenth as much electricity (See Figure 4).[5] Access to electricity in Nigeria was last estimated at around 50% for the country as a whole. In rural areas only 35% of the population is able to receive electricity from the grid.[6] Power outages reportedly take place more than 320 days per year. As a result, 60% of Nigerian businesses are estimated to have their own backup generators.[7] These generators run on diesel and gasoline. This increases reliance on oil products and, in turn, increases the cost of electricity. When a fuel shortage struck in spring 2015, a national crisis quickly followed, disrupting cell phone service, temporarily closing bank branches and grounding airplanes.

Figure 4. Power Consumption Comparison



[5] *Antonio Castellano et al, Brighter Africa: The growth potential of the sub-Saharan electricity sector (McKinsey & Company, 2015), 3*
[6] *Vivien Foster & Nataliya Pushak, Nigeria's Infrastructure: A Continental Perspective (World Bank Policy Research Working Paper No. 5686), 35*
[7] *Vivien Foster & Nataliya Pushak, Nigeria's Infrastructure: A Continental Perspective (World Bank Policy Research Working Paper No. 5686), 26*

Figure 5. Electricity Consumption and GDP Per Capita by Country



The power shortages and blackouts in Nigeria brought dire consequences upon the society and the economy. Lack of power has resulted in rising anger among voters for whom reliable electricity was supposed to be a dividend of democracy and economic growth. In addition, GDP in Nigeria suffers a 4 percent loss annually due to power shortages, according to World Bank.[8]

Electricity consumption and economic development often go hand-in-hand. Nigeria will be able to unleash rapid growth only when it takes steps forward in the power sector (See Figure 5).[9]

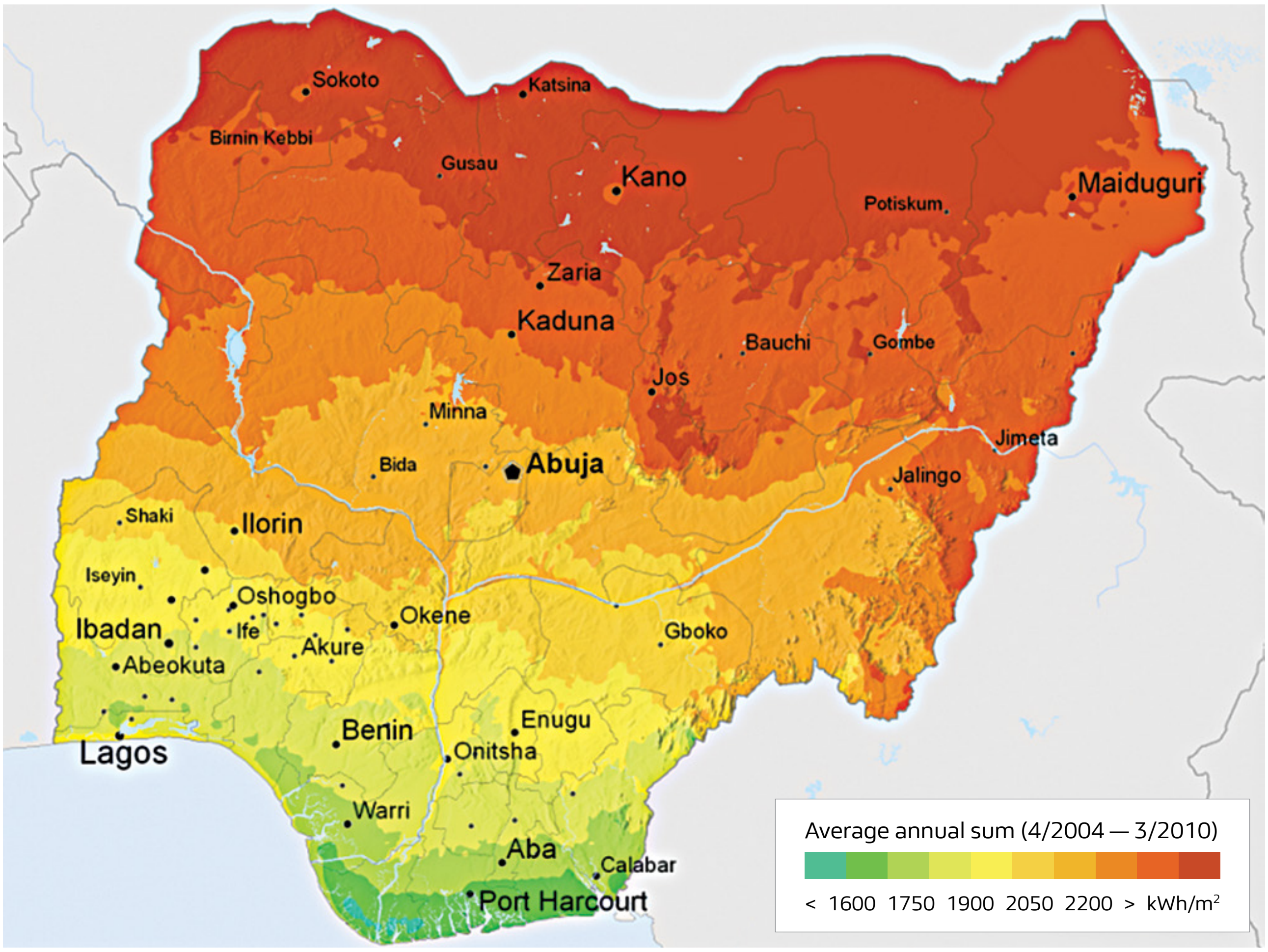
[8] *Economist, Lighting a Dark Continent (Economist, 2014).*
[9] *Antonio Castellano et al, Brighter Africa: The growth potential of the sub-Saharan electricity sector (McKinsey & Company, 2015), 6..*

Solar is the Answer

Research indicates Nigeria receives abundant sunshine where 1,500 petajoules (PJ) (equivalent to 258 million barrels of oil) could be available annually from solar energy. Due to the numerous disadvantages of conventional fuel sources and the recent strides in PV cell efficiency, Nigeria needs to leverage solar resources to secure its energy supply. Despite Nigeria's rich endowment in solar resources, very little progress has been made, as the previous government failed to take pragmatic steps toward utilizing solar energy.

With advancements in solar technology and the renewed push from the Energy Commission of Nigeria, now is the time to invest in Nigeria's solar industry. From the economic side, solar cell development has led to a steady decline in the cost of solar components and site construction, making it more competitive against other sources of energy. From the policy perspective, the National Renewable Energy and Energy Efficiency Policy (NREEEP) initiative is gaining momentum: Nigeria aims to establish 1.2 gigawatts (GW) of solar generation by 2020, transforming the country into a renewable energy leader of the continent.

Figure 6. Nigeria's Horizontal Irradiation Map



Solar Advantage: Reducing Dependencies on Fossil Fuels

Nigeria is the world's twelfth largest producer of crude oil, having produced 2.5 million barrels of sweet, light petroleum crude per day in 2011. Nonetheless, It does not have the capacity to refine most of its crude: it exported over 98% of its production in 2009, according to the International Energy Agency.[10] Because Nigeria cannot refine the majority of its crude oil, most oil products are imported from abroad, which contributes to trade deficits.

The central bank of Nigeria estimates losses related to fuel subsidies in 2011 at over NGN 2trillion (US$12.4billion). This amount represents over 39% of the Government of Nigeria's expenditure in 2011. The ramifications may be severe for the poor, as welfare spending in healthcare and education becomes unaffordable.

By contrast, solar energy production does not require fossil fuels. Although there is variability in the amount and timing of sunlight, a properly configured solar energy conversion system can be designed to provide reliable electricity supply.

Grid connected PV systems provide affordable and sustainable energy (no exhaust fumes, no noise, no effects to water and associated uses, no fuel spillages when compared to diesel generators and easy to deploy/implement when compared to hydropower). Furthermore, solar plants can be built close to where the power is consumed, putting minimal stress on the grid.

[10] *(international energy Agency[ieA],2010).*

Solar Advantage: Job Creation

Facility construction and the subsequent maintenance phase will create employment opportunities to Nigeria's local population and communities. It is estimated that 1,000MW of added electricity capacity would support the development of over 20,000 businesses, which could provide over 800,000 salaried jobs.[11] This will generally improve the economic situation of the local residents in Nigeria. It is expected that between 500 and 1,000 employment opportunities would be available during the construction phase of the project (See Figure 7).[12]

The majority of the employment opportunities, specifically the skilled and semi-skilled jobs, are likely to be associated with the construction of the facility and associated infrastructure. Additionally, it is expected that during construction, local materials suppliers/traders for sand, cement, steel, stone aggregate and general transportation services will benefit greatly from this project.

[11] *Based on the co-causal positive correlation between growth in electricity production and waged employment in the modern sector, Kenya, 2001-2013. Data source: Kenya National Bureau of Statistics.*
[12] *Irena website, http://www.irena.org/rejobs.pdf.*

Figure 7. Job Creation by Renewable Energy Type

TECHNOLOGY	MCI (Jobs per newly installed MW)	O&M (Jobs per MW)	REGION	YEARS OF ESTIMATION	SOURCE
Wind, onshore	8.6	0.2	OECD countries (Average values)	Various (2006 - 2011)	Source 1
	27.0	0.72	South Africa	2007	Source 2
	6.0[a]	0.50	South Africa	NA	Source 3
	12.1	0.1	United States	2010	Source 4
	8.8	0.4	Greece	2011	Source 5
Wind, offshore	18.1	0.20	OECD countries (Average values)	2010	Source 1
Solar PV	17.9	0.30	OECD countries (Average values)	Various (2007 - 2011)	Source 1
	69.1	0.73	South Africa	2007	Source 2
	25.8	0.70	South Africa	NA	Source 3
	20.0	0.2	United States	2011	Source 4
CSP	18.0	1.33	South Africa	2007	Source 2
	36.0	0.54	South Africa	NA	Source 3
	7.0	0.6	Spain	2010	Source 6
	19.0	0.9	Spain	2010	Source 7
Hydro, large	7.5	0.30	OECD countries (Average values)	Various	Source 1
Hydro, small	20.5	2.40	OECD countries (Average values)	Various	Source 1
	20.3	0.04	South Africa	2009	Source 2[b]
Geothermal	10.7	0.40	OECD countries (Average values)	Various (2009 - 2012)	Source 1
	5.9	1.33	South Africa	2004	Source 2
Biomass	7.7	5.51	South Africa	2000	Source 2

a. A probable reason for the smaller MCI employment factor in the Green jobs report is because the authors do not account for differences in regional labour pruductivites.
b. The source does not specify small hydro; however, the number provided is based on another study focused on small hydro
Sources: 1) Rutovitz and Harris (2012); 2) Rutovitz (2010); 3) Maia et al. (2011); 4) National Renewable Energy Laboratory NREL (2010); 5) Tourkollas and Mirasgedis (2011); 6) NREL (2013); and 7) NREL (2012).

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