The installed capacity of wind and solar power in Africa increased by 600 percent between 2010 and 2017 (Figure 1). Investment in both technologies is expected to continue expanding as countries broaden access to grid electricity and meet increasing demand while reducing dependence on fossil fuels (IEA 2016).

IRENA (2016a) projected that Africa will require electric power capacity of 610 gigawatts (GW) by 2030, up from 185 GW in 2014. IRENA estimated that renewable energy sources could account for 310 GW of the total, including 100 GW from wind, 38 GW from concentrating solar power (CSP), and 30 GW from photovoltaics (PV), as shown in Figure 2.

**Figure 1.** Solar and Wind Power Installed Capacity in Africa, 2010-2017

**Figure 2.** Projected Electric Power Capacity in Africa, by Source, 2013 and 2030
South Africa switched from feed-in-tariffs (FITs) for renewable energy to auctions in 2011 (Baker 2017). Between 2012 and 2016, South Africa attracted more than $17 billion in clean energy investments (BNEF and UK Aid 2017). Ghana and Uganda have also switched from FITs to auctions. Kenya plans to switch from FITs to auctions by 2020. Botswana, Burkina Faso, Cameroon, Ethiopia, Madagascar, Mauritius, Namibia, Senegal, and Zambia have also implemented renewable energy auctions (Lucas et al. 2017).

The World Bank’s Scaling Solar Program combines auctions with financing and insurance for bidders and risk management and credit enhancement products. Scaling Solar aims to develop more than 1,400 megawatts (MW) of solar power by 2020 through active engagements in Ethiopia, Madagascar, Senegal, and Zambia (Scaling Solar 2018). The governments of Germany, Norway, and the United Kingdom, as well as the European Union and the World Bank have provided technical assistance, financial incentives, funds to build interconnection infrastructure, and financial guarantees to complement auctions in Ghana and Uganda (Lucas et al. 2017).

Utility-scale solar PV investments in Africa in 2015 and 2016 had estimated costs of $1.3 to $4.1 per watt (W), compared with a worldwide weighted average of $1.8/W in 2015 (Figure 3). The Levelized Cost of Energy (LCOE) from onshore wind in Africa in 2016-2017 was $0.09/kWh, compared with $0.08/kWh in Europe and $0.10/kWh in Central America and the Caribbean (IRENA 2018b). Egypt and Morocco have both attracted investments for solar electric installations larger than 180 MW, requiring significant debt by bringing together a group of diverse public and private investors (BNEF and UK Aid 2017).
Figure 4 shows that Africa has tremendous solar potential, distributed across multiple countries. African capital cities receive an amount of solar power ranging between 1,750 and 2,500 kWh/m²/year (IRENA 2016b).

**Figure 4. Average Electric Power Potential Per Peak Kilowatt of Grid-Connected Photovoltaics in Africa, 1994-2015**

Africa has a theoretical potential of 470,000 terawatt hours (TWh) for CSP and 660,000 TWh for photovoltaics. East and Southern Africa have the highest potential (Figure 5).

**Figure 5. Theoretical Potential for Concentrated Solar and Photovoltaic Power in Africa, by Region (TWh)**

Source: Based on data from IRENA 2014.

IEA (2016) estimated that electric power generation from PV in Africa will increase from 2.9 TWh in 2015 to 16.2 TWh in 2021 (Figure 6). It also estimated that electric power generation from CSP will increase from 0.3 TWh to 4.3 TWh over the same period (Figure 7). South Africa, Morocco, and Egypt are expected to have the largest share of electric power generation from PV and CSP technologies.

**Figure 6.** Projected Electricity Generation from Photovoltaics in Africa, 2015-2021 (TWh)

![Projected Electricity Generation from Photovoltaics in Africa, 2015-2021 (TWh)](image)

*Source: Based on data from IEA 2016.*

**Figure 7.** Projected Electric Power Generation from Concentrating Solar in Egypt, Morocco, and South Africa, 2015-2021 (TWh)

![Projected Electric Power Generation from Concentrating Solar in Egypt, Morocco, and South Africa, 2015-2021 (TWh)](image)

*Source: Based on data from IEA 2016.*
Figure 8 shows wind power densities in Africa. Algeria, Chad, Egypt, Madagascar, Namibia, Somalia, South Africa, and Sudan have high wind power density areas.

**Figure 8. Wind Power Density in Africa**

Source: Technical University of Denmark 2017.
Note: Power density at 100m height.
IRENA (2014) estimated Africa’s theoretical wind potential at 460,000 TWh in 2014. Algeria, Egypt, Somalia, South Africa, and Sudan are among the countries with the highest wind energy potential (Figure 9).

**Figure 9. Theoretical Potential for Wind Power in Africa, by Region (TWh)**

![Figure 9. Theoretical Potential for Wind Power in Africa, by Region (TWh)](source: Based on data from IRENA 2014.)

IEA (2016) estimated that onshore wind power generation in Africa would increase from 8.4 TWh in 2015 to 29.1 TWh in 2021. South Africa, Egypt, and Morocco are expected to have the largest share of this power (Figure 10).

**Figure 10. Projected Electricity Generation from Onshore Wind Power in Africa, 2015-2021 (TWh)**

![Figure 10. Projected Electricity Generation from Onshore Wind Power in Africa, 2015-2021 (TWh)](source: Based on data from IEA 2016.)
African utilities are looking at the potential of smart grid technologies to reduce losses from theft and transmission and distribution (T&D) while building new infrastructure to meet increasing demand (ITA 2017).

T&D products and services will be increasingly important as governments and regulators look to implement policies that expand regional grids, while increasing the resilience and integration of distributed energy resources. Four regional power pools aim to integrate the electricity markets in Africa, covering Central, Northern, Southern, and Western Africa (Deloitte 2015). These regional projects are slowly developing, but interest in integrating geographically disperse, variable renewable energy sources could spur regional cooperation.

Egypt started talks with Burundi, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda to build the T&D infrastructure to connect these countries’ grids. These discussions took place in the context of the Nile Basin Initiative, which has already supported power projects connecting the grids of Ethiopia and Sudan, and of Zambia, Tanzania, and Kenya. Ethiopia has allocated 30 percent of its power infrastructure investment to regional T&D interconnections, including a 1,045-km voltage line under the Ethiopia-Kenya Power Interconnection Project. When completed in 2019, this new transmission line, with a capacity of 2 MW, will allow Ethiopia to expand domestic distribution of electricity and export surplus energy to Kenya (ITA 2017).
REFERENCES


