



# Africa Energy Needs

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# Africa energy needs

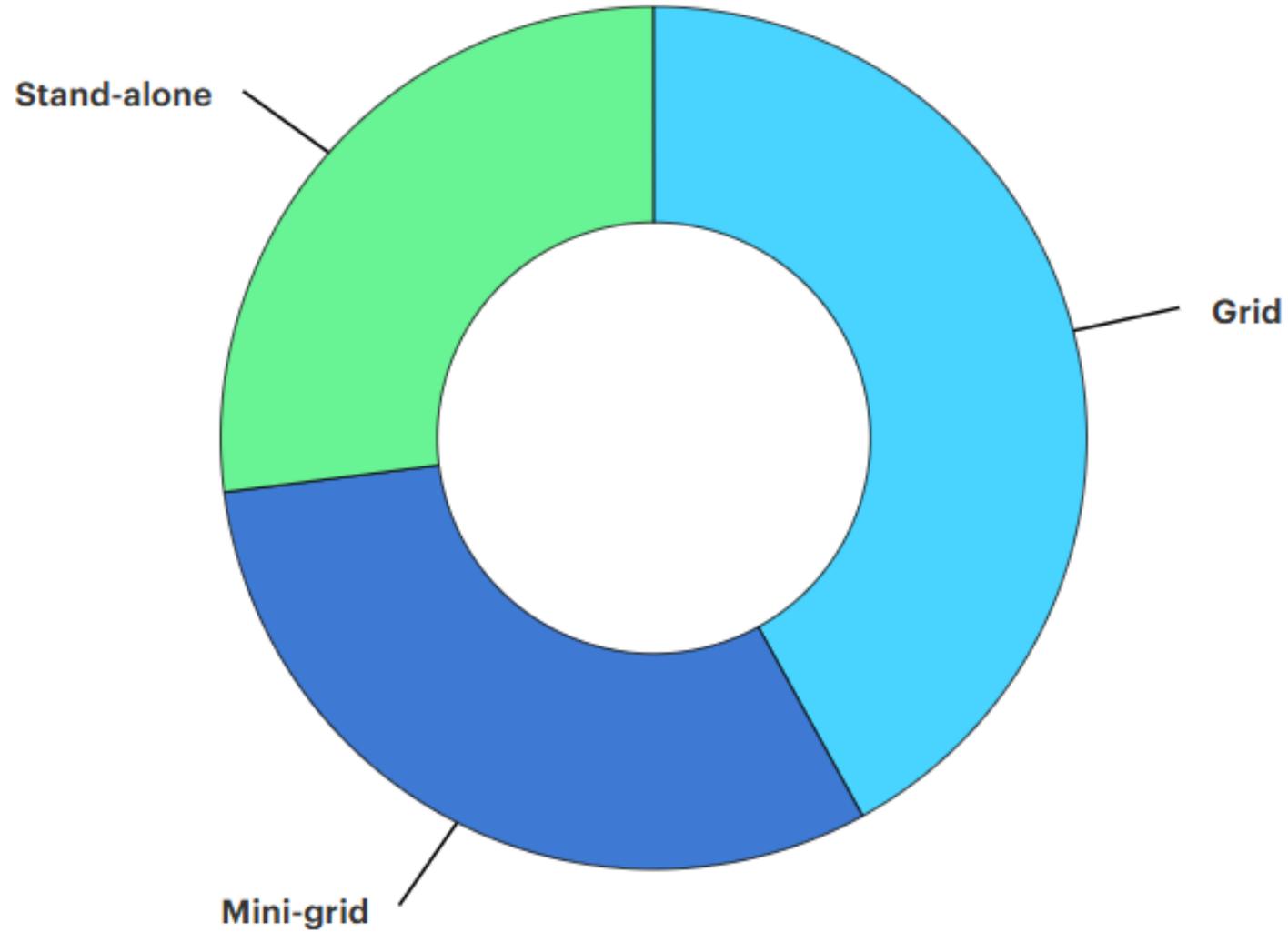
- At present, 600 million people, or 43% of the total population, lack access to electricity, most of them in sub-Saharan Africa.
  - Extending national grids is the least costly and most prudent option for almost 45% of those gaining access to 2030.
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# Africa energy needs -continued

- ▶ In rural areas, where over 80% of the electricity-deprived live, mini-grids and stand-alone systems, mostly solar-based, are the most viable solutions.
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# Africa energy needs - continued





# Hydroelectric power source

- Africa is home to some of the world's largest dams.
  - While the world transitions to cleaner forms of power, dams have been a reliable source of hydroelectric energy for decades, generating substantial amounts of electricity.
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# Notable hydroelectric dams

- The Grand Ethiopian Renaissance Dam (GERD) – 6,450 MW
- Aswan High Dam – 2,100 MW Egypt
- Cahora Basa Dam – 2,070 MW Mozambique
- Gilgel Gibe III Dam – 1,870 MW Ethiopia
- Inga Dams – 1,775 MW DRC
- The Kariba Dam – 1,626 MW - Zimbabwe/Zambia
- Merowe Dam – 1,250 MW Sudan
- Tekezé Dam – 1,200 MW Ethiopia
- Akosombo Dam – 1,020 MW Ghana
- Kainji Dam – 760 MW Nigeria

# Threats to hydroelectric



## Thermal power source

- Several African countries have thermal energy sources as part of their electricity energy mix. Electricity from thermal energy can be sourced from
  - burning oil,
  - gas, or
  - coal.

# Thermal solar array reflectors



# Parabolic thermal reflectors



## Threats to thermal power sources

- ▶ The timeline for fossil fuel depletion varies depending on the type of fuel and current consumption rates. Here's a general estimate based on current data:
  - **Oil:** Approximately **53 years** of reserves left at the current rate of consumption.
  - **Natural Gas:** Around **40 years** of reserves remaining.
  - **Coal:** Estimated to last about **70 years**

## Wind power sources

- ▶ Wind power electricity generation in Africa has significant potential but remains largely untapped.
- ▶ Though the continent holds **100 GW** of wind capabilities, the current installed capacity as at **2018 was 5.7 GW** with countries in northern Africa as well as South Africa capturing over **90%** of the wind energy share on the continent.



# Wind energy threats



Intermittency





## Solar energy sources

- Solar farms for electricity generation in Africa present a promising solution to address energy needs across the continent.
- Most solar energy harvesting is through
  - PV modules
  - Concentrated Solar Power

# Solar power notable examples

- Ouarzazate Solar Power Station **CSP plant 580 MW Morocco**
- Benban Solar Project **PV plant 1.8 GW Egypt**
- Solar Capital de Aar **PV plant 175 MW South Africa**
- Kathu Solar Park **CSP plant 100 MW Cape Province South Africa**
- Ilanga Concentrated Solar Power **CSP plant 100 MW South Africa**
- KaXu Solar One **CSP plant 100 MW South Africa**
- Xina Solar One **CSP plant 100 MW South Africa**
- Jasper Solar Power Project **PV plant 96 MW South Africa**
- Kalkbult Solar Plant **PV plant 75 MW South Africa**
- Lesedi Solar PV Project **PV plant 75 MW South Africa**



## Threats to solar energy

- Intermittent – Available during the day
- Storage challenges – Once energy has been produced, unspent energy is lost

# Geothermal power sources

- Geothermal energy is one of the most reliable renewable energy sources and some countries have invested heavily in tapping this type of energy. Geothermal energy presents a promising renewable resource for electricity generation in Africa, particularly in countries along the East African Rift System



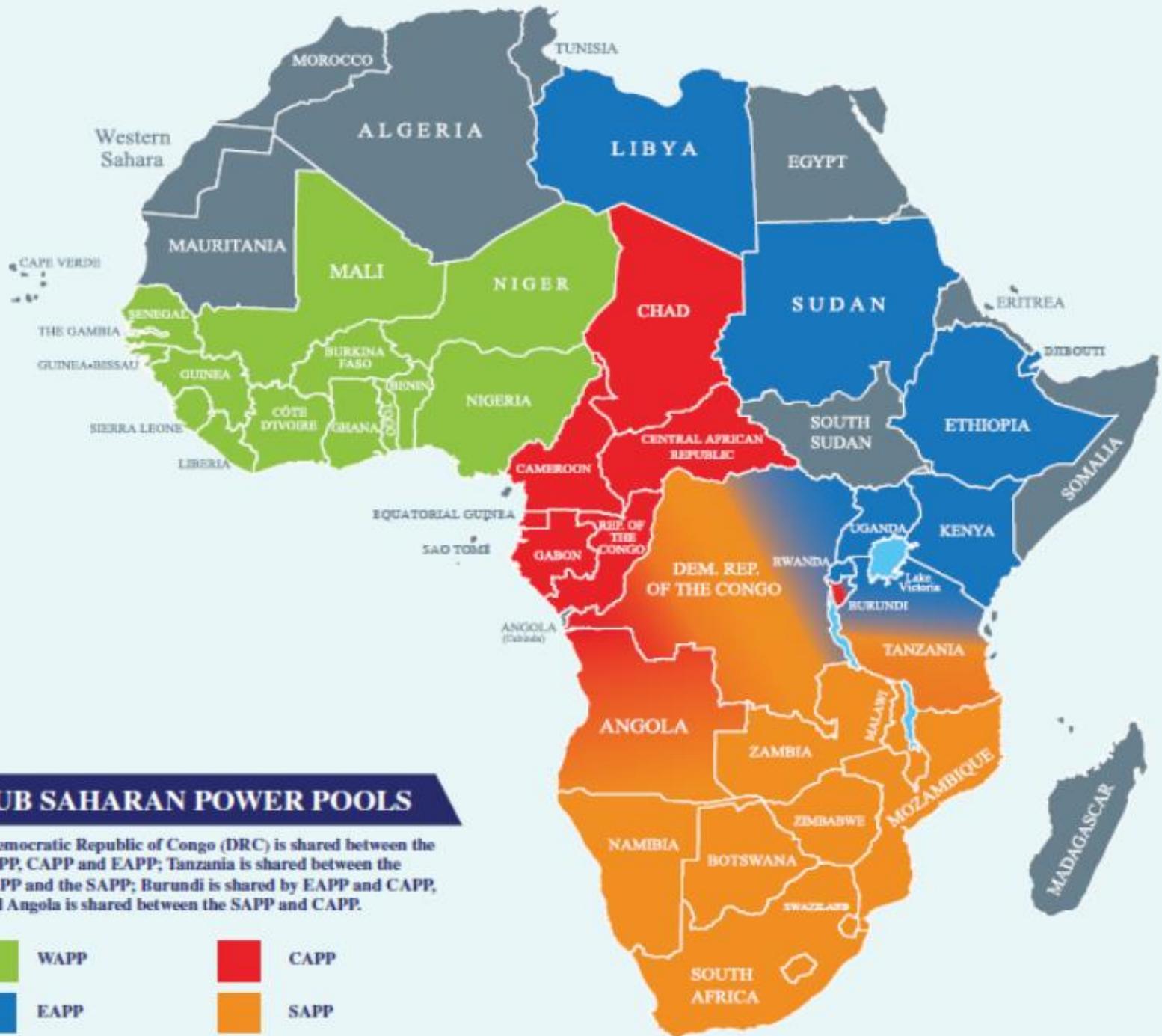
# Power pools in Africa

- African countries have been endowed with different energy resources such as hydropower, geothermal energy, solar energy, and fossil fuels.
  - African countries are collaborating to enhance energy access across borders by pooling their resources.
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### SUB SAHARAN POWER POOLS

\*Democratic Republic of Congo (DRC) is shared between the SAPP, CAPP and EAPP; Tanzania is shared between the EAPP and the SAPP; Burundi is shared by EAPP and CAPP, and Angola is shared between the SAPP and CAPP.

- WAPP
- EAPP
- CAPP
- SAPP



# South African power pool

- ▶ Southern African Power Pool (SAPP): Established in 1995, it includes 12 countries in Southern Africa.
  - ▶ Member countries of SAPP include: Angola, Botswana, Democratic Republic of the Congo, Eswatini, Lesotho, Mozambique, Malawi, Namibia, South Africa, Tanzania, Zambia, and Zimbabwe.
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# West African power pool

- ▶ West African Power Pool (WAPP): Created in 2000, it comprises 14 countries in West Africa.
  - ▶ The member countries are Benin, Burkina Faso, Ghana, Guinea, Guinea Bissau, Ivory Coast, Mali, Niger, Nigeria, The Gambia, Togo, Senegal, and Sierra Leone
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# East African power pool

- East African Power Pool (EAPP): Formed in 2005, it includes 11 countries in East Africa.
  - The pool comprises the following countries: Burundi, Djibouti, Democratic Republic of Congo (DRC), Rwanda, Egypt, Ethiopia, Kenya, Sudan, Tanzania, Uganda, and Libya. South Sudan and Somalia joined recently and there's a possibility that Eritrea may join
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# Central African power pool

- ▶ Central African Power Pool (CAPP): Established in 2003, it consists of 10 countries in Central Africa.
  - ▶ Angola, Burundi, Cameroon, Republic of the Congo, Central African Republic, Chad, Democratic Republic of the Congo, Gabon, Equatorial Guinea, São Tomé and Príncipe
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# North African power pool

- ▶ North African Power Pool (NAPP): Also known as COMELEC, it includes five countries in North Africa.
- ▶ Member countries are Algeria, Libya, Mauritania, Morocco, and Tunisia. One of the projects in the 2,700-kilometre (1,678 mi) high-voltage power line from Morocco to Egypt through Algeria, Tunisia and Libya.



# Benefits of power pools

- Enhanced energy security through diversified power sources
  - Improved grid stability and reliability
  - Reduced overall system costs through economies of scale
  - Increased renewable energy integration
  - Promotion of regional cooperation and economic integration
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# Invest in further research

- Research to build capacity in transmission equipment like transformers
  - Research into new power generation techniques
  - Research into power storage techniques
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Thank You for Listening