Aloe Energy

COUNTRY REPORT · NOVEMBER 2026

Sudan: grid and electricity access

Eastern Africa Power Pool

16 M
people live without night-time light, a proxy for no power

50%
of them live within 15 km of a power line

7,162
km of high-voltage lines, 66 kV and above

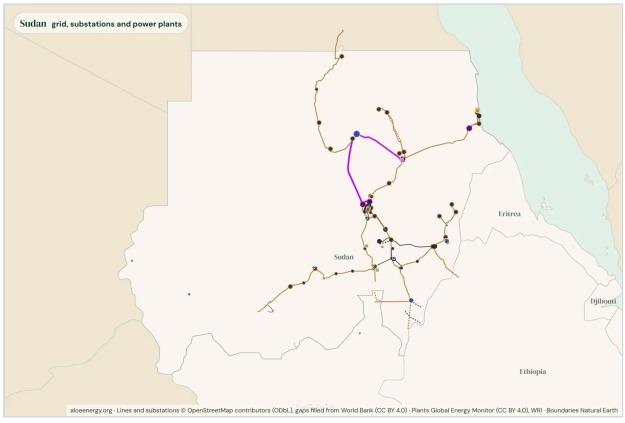
3,760
MW of operating power plants, 10 MW and above

5
power plants and transmission lines planned or under construction

About 16 million people in Sudan live where satellites see no electric light at night, and 50% of them live within 15 km of a power line. This page brings together what our open atlases show for Sudan: about 7,162 km of high-voltage lines, 3,760 MW of power plants and the projects still to come.

WHAT THIS MEANS

5.6 million people without power live 2 to 15 km from a line: close enough to plan for the grid, too far for a quick connection.



Map: Aloe Energy EAPP grid atlas. Lines © OpenStreetMap contributors (ODbL).

NEAR THE GRID, NOT ON IT

About 16 million people in Sudan, roughly 31% of the population, live where satellites see no electric light at night. Of them, 50% live within 15 km of a mapped or predicted power line: 2.4 million within 2 km, 5.6 million 2 to 15 km away, and 7.9 million farther out. The largest group lives more than 15 km from any line, where standalone solar and mini-grids are the realistic first step for years to come.

- Within 2 km of a line: **2.4 million** (15%)
- 2 to 15 km: **5.6 million** (35%)
- More than 15 km: **7.9 million** (50%)

"Without night-time light" is a satellite proxy, not a measured access rate.

THE GRID TODAY

Sudan's mapped high-voltage network runs to about 7,162 km of lines at 66 kV and above, with 65 substations. The highest voltage on the map is 500 kV, and 84% of the line length runs at 220 kV or more. About 480 km come from older World Bank (2017) maps, used where OpenStreetMap has gaps. Installed capacity was about 4,020 MW (2024). The latest international tracking report puts access to electricity at 66% of people.

Mapped line length

Voltage	km
500 kV	979
220 kV	4,612
110 kV	848
66 kV	159
Voltage not recorded	84
Gap-fill from older public maps	480
Total	**7,162**

PLANTS AND PIPELINE

There are 25 operating power plants of 10 MW and above, adding up to about 3,760 MW, 50% of it hydro. The largest is Merowe Dam hydroelectric plant (1,250 MW, hydro). Another 4 plants totaling about 1,370 MW are under construction or planned, 170 MW of them under construction.

Operating capacity by type



Hydro: **1,891 MW** (50%) Oil: **1,077 MW** (29%)
Gas: **554 MW** (15%) Biomass: **184 MW** (5%)
Other: **54 MW** (1%)

Promised and now expected dates

Project	Type	MW	First promised	Now expected
Ethiopia-Sudan second interconnector 500 kV	Line	-	2020	2032

EMISSIONS

In 2024, each megawatt-hour used in Sudan came with about 0.15 tonnes of CO2, including imports. The table also gives the combined margin used for carbon projects.

Grid emission factor, 2024 (tCO2/MWh)

Measure	tCO2/MWh
Generated in country	0.155
Electricity used, with imports	0.147
Combined margin (for carbon projects)	0.231

SECOND LIFE

Between 2026 and 2040, about 712 tonnes of solar equipment and stationary batteries are expected to retire in Sudan, most of it solar panels. That is 0.1% of the total for the 49 countries in our second-life atlas.

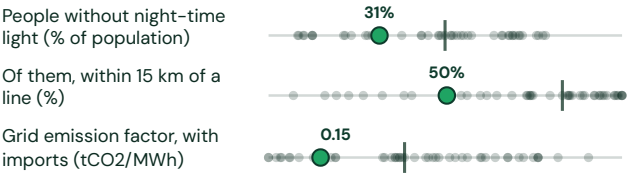
Solar and batteries retiring each year (tonnes)



CLEAN ENERGY CERTIFICATES

I-REC status: not approved yet, so renewable plants here cannot issue I-RECs.

HOW IT COMPARES



Each dot is one country with a page on aloeenergy.org; the line marks the median. Positions only, no ranking.

Sources: Grid lines: OpenStreetMap contributors (ODbL), gap-fill from the World Bank Africa grid (2017); power plants: Global Energy Monitor (September 2026), WRI and public project sources; capacity and access: regulators, utilities and Tracking SDG7 2026; people and distance to the grid: WorldPop 2020 and gridfinder (CC BY 4.0); second life: Aloe second-life model (central case); emission factor: Aloe grid emission factors (Ember).

Aloe Energy

The full page, with the interactive atlas, is at aloeenergy.org/countries/sudan. The maps are free to view; the data behind them is available on request: brandon@aloeenergy.org. Aloe Energy is a not-for-profit initiative working on energy access across Africa, with open grid maps and data from Southern and Eastern to West and Central Africa.

Cite as: Aloe Energy (2026). Sudan country report, November 2026. aloeenergy.org/countries/sudan. Free to share under CC BY 4.0.

Scan for the live page and map

FULL DATA

More about Sudan

Everything else our research pages show for this country, from published sources. Each section names the page where the method and sources are.

PRICES AND RELIABILITY

LIT BUT OFF THE MAP

Where the lights are and the map is not

Satellites see 1,505 lit places in Sudan at night. 310 are within 2 km of a mapped line, 442 are 2 to 10 km away and 753 are 10 km or more from any mapped line. Places lit far from the map point to lines the map is missing, mines and plants with their own power, or mini-grids.

The lit places off the map cover about 5,080 km² and are home to about 11,548,732 people.

Lit places by distance to a mapped line

Distance	Lit places	Newly lit
Within 2 km of a mapped line	310	
2 to 10 km away	442	362
10 km or more	753	626

See them on the map: the "Lit but off the map" layer of the grid-edge atlas (aloeenergy.org/research/grid-edge).

WATER AND CLIMATE RISK

Hydro and drought

Hydro is 50% of the operating power plants in Sudan and made 78% of its electricity in 2024.

A dry year that takes a fifth of hydro output would cost about 261 MW on average over the year, and a severe drought (two fifths, as Zambia saw in 2024) about 521 MW.

The import lines have room for about 100 MW more than they carry under firm contracts today.

Hydro exposure

Measure	Value
Hydro in operating capacity	50%
Operating hydro (MW)	1,891
Hydro in 2024 generation	78%
Dry year, average MW lost	261
Severe drought, average MW lost	521
Spare import room (MW)	100

Method and all countries: hydro dependence and drought exposure (aloeenergy.org/research/hydro-exposure).

CLIMATE AND CARBON

Carbon per new connection

The Mission 300 compact for Sudan adds about 2.91 million new connections by 2030: 1.82 million to the grid, 0.42 million on mini-grids and 0.67 million with solar home systems.

Counted with what household surveys show people use for light now (kerosene is the main light in 5% of homes without power), they avoid about 58,121 t of CO2 a year and add about 107,814 t from the power they use, a net addition of 49,693 t a year.

New connections and CO2, central case

Measure	Value
New connections by 2030	2,912,164
CO2 avoided (t a year)	58,121
CO2 added (t a year)	107,814

Measure	Value
Net CO2 avoided (t a year)	-49,693
Net per 1,000 connections (t a year)	-17.1

The default methodology view and every source: carbon per connection (aloeenergy.org/research/carbon-per-connection).

FROM POWER PLANT TO BATTERY SITE

When the thermal plants close

Sudan has 8 coal, gas or oil plant sites of 50 MW or more, with 2,151 MW of grid connection. 910 MW of it frees up by 2030 in our central case.

Putting solar and batteries on those connections when they free up would save about 8.7 Mt of CO2 between 2026 and 2050, worth about 1.1 times what they cost to build at the US EPA's social cost of carbon.

Largest sites

Plant	Fuel	Connection (MW)	Frees up	CO2 saved 2026-2050 (Mt)
Kosti power plant	Oil	500	2051	0.0
Port Sudan power station	Gas	374	2057	0.0
Mahmoud Sharif power station	Oil	320	2026	3.0
Kilo-X Dit power plant	Oil	257	2049	0.2
Garri 2 Power Plant	Gas	220	2026	2.1
Garri 1 Power Plant	Gas	220	2026	2.1
Karadeniz Powership	Gas	150	2030	1.1
Garri 4 Power Plant	Oil	110	2045	0.2

Timings, cases and every site: power plant to battery site (aloeenergy.org/research/thermal-to-storage).

CIRCULAR AND MOBILITY

WASTE TO WEALTH

Power from waste

Sudan's sugar mills, landfills, sewage works, factories and crop residues could make about 114 MW of power that is not built yet (central case), avoiding about 185,976 t of CO2e a year.

Power from waste by source (MW, central case)

Source	MW
Sugar mills and farms	62.0
Landfill gas and biogas	1.3
Industrial waste heat	6.9
City waste	17.1
Crop and sawmill residues	26.6

Largest sites

Site	What	MW
Khartoum	City waste incineration	14.7
Kenana	Sugar mill boiler upgrade	13.3
White Nile Sugar	Sugar mill boiler upgrade	13.3
Guneid	Sugar mill boiler upgrade	8.9
New Halfa	Sugar mill boiler upgrade	8.9
Sennar	Sugar mill boiler upgrade	8.9
Assalaya	Sugar mill boiler upgrade	8.9
Berber Cement Barbar Cement Plant	Cement kiln waste heat	2.1

Every site, costs and the method: power from waste (aloeenergy.org/research/waste-to-energy).

SECOND LIFE

Who could use a second-life panel

Places in Sudan that could use a second-life solar panel add up to about 4,500 MWp (range 2,017 to 10,175): 4,371 MWp to cut generator use in towns, 79 MWp for mini-grids, 40 MWp for household systems and 10.3 MWp for 152 health facilities and 4 schools with no light at night.

Mapped by half-degree cell, with years to 2040: where the panels are needed (aloeenergy.org/research/second-life#where-demand).

E-MOBILITY

Electric transport, per km

On Sudan's grid, an electric motorbike emits about 10 g of CO2 per km from the power it charges with, against 48 g for a petrol one (79% less).

CO2 per km from use (g)

Vehicle	Electric	Petrol or diesel	Difference
Motorbike	10	48	-79%
Bus	190	1,673	-89%
Small car (newer petrol car)	31	125	-75%

Life-cycle figures, a cost calculator and city air: e-mobility (aloeenergy.org/e-mobility#per-km).

Sources: Lit places: NASA Black Marble night lights, compared with our mapped lines (grid-edge atlas). Hydro and drought: our hydro exposure analysis (plants from our grid atlases; generation from Ember, corrected with regulator figures). Carbon per connection: compact targets, household lighting surveys (census, MICS, DHS, MTF) and our grid emission factors. Thermal plant sites: Global Energy Monitor, Global Integrated Power Tracker (September 2026), and our thermal-to-storage model. Power from waste: FAOSTAT, Global Energy Monitor and OpenStreetMap sites, in our waste-to-energy model. Second-life demand: grid-edge screening, compact targets, World Bank Enterprise Surveys and health and school facility lists, in our second-life atlas. Transport per km: our grid emission factors and vehicle energy use; running costs from national pump prices and tariffs.