

# **Sudan photovoltaic and off-grid energy storage benefits**

Is solar energy feasible in Sudan?

Situated in the sunbelt, Sudan is one of the largest countries in Africa endowed with an extremely high solar irradiation potential. However, no work has been done in the literature with a strategic context to study specifically the feasibility of renewable energy systems in Sudan despite the abundance of solar resource.

Which type of solar PV system is best for Sudan?

HOMER simulation results demonstrated that the optimal type of PV for Sudan is the Studer VarioTrack VT-65 with Generic PV. The utilization of a solar PV system will avoid the production of approximately 27 million kg/year of pollutants and will reduce the cost of energy to USD\$ 0.08746/kWh.

Will solar power help solve Sudan's electricity crisis?

Given that Sudan is endowed with an extremely high solar irradiation potential, the government has set a target of achieving a 667 MW of PV installed capacity by the end of 2031 (Murdock et al. 2019). This clearly reflects that the latter technology will play a key role in adjusting the electricity crisis of Sudan in the near future.

Where can solar energy be used in Sudan?

The optimal locations found in Sudan for utilizing solar energy were Wawa, followed by Kutum, Wadi Halfa, Dongola and Al-Goled due to their low costs of electricity, high clearness index and high levels of solar radiation.

Can Sudan maximize its energy resources?

The analysis reveals promising indicators of Sudan's ability to maximize its solar, wind, and geothermal energy resources. It also presents conclusions and recommendations concerning the future of RE policies and production in Sudan.

How can Sudan achieve energy self-sufficiency?

Encouraging solar and wind power in the country's energy portfolio could help Sudan achieve its goal of energy self-sufficiency. Egyptian policies such as nurturing and promoting renewable technologies and scientific research, feed-in tariffs, and tax exemptions could help Sudan achieve its objectives.

A just-commissioned solar and battery storage system will reduce diesel consumption by at least 80% at a base for 300 humanitarian workers in South Sudan managed by UN migration body IOM.

However, rooftop solar PV has not yet been widely adopted in many sub-Saharan African countries, such as Sudan, although they are endowed with high solar radiation and in dire need of...

The BAPV systems can be broadly divided into two categories, off-grid and grid-connected PV systems.

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Furthermore, there are three forms of the off-grid PV systems, the hybrid PV system, the no battery system, and the battery system, respectively. In order to ensure system power stability, the hybrid PV system and the battery system are usually ...

Developed by the National Renewable Energy Laboratory (NREL), HOMER allows the user to design and investigate financial and technical options for on-grid and off-grid energy systems. The software permits project investigation by exploring different aspects of energy projects (including location, system sizing, weather data, and economic ...

A grid connected PV system solves the need for power in the Sudan. Now the Sudan government is considering permitting the feed-in from private sector and to end the monopoly of power generation.

Due to the inherent instability in the output of photovoltaic arrays, the grid has selective access to small-scale distributed photovoltaic power stations (Saad et al., 2018; Yee and Sirisamphanwong, 2016).Based on this limitation, an off-grid photovoltaic power generation energy storage refrigerator system was designed and implemented.

Economic challenges novative business models must be created to foster the deployment of energy storage technologies. A review is provided in [12] that shows energy storage can generate savings for grid systems under specific conditions. However, it is difficult to aggregate cumulative benefit streams and thus formulate feasible value propositions [13], ...

Over the past decade, global installed capacity of solar photovoltaic (PV) has dramatically increased as part of a shift from fossil fuels towards reliable, clean, efficient and sustainable fuels (Kousksou et al., 2014, Santoyo-Castelazo and Azapagic, 2014).PV technology integrated with energy storage is necessary to store excess PV power generated for later use ...

In the light of the economic impracticality associated with extending utility grids to remote rural communities, coupled with the prevalence of freely available solar energy [8], standalone photovoltaic (PV) mini-grids emerge as a potential solution to address the electricity deficit and bridge the energy gap.The functionality of standalone photovoltaic systems is ...

Egyptian energy services company Elsewedy Electric T& D (EETD) recently secured a contract to build a 20 MWp PV plant and 35 MWh storage system in South Sudan. November 27, 2020 Edgar Meza 1

Community-shared solar PV systems support the democratization with the efficiency of centralized systems. The paper highlights the economic competitiveness of this model in Hungary.

The energy sector moves into microgrids (MG) and the age of distributed generation [1] 2040, total energy consumption is expected to increase by approximately 30.1% over 2015 [2].Almost 75% of the world's

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electricity is generated using fossil fuels referred to as conventional energy sources [3]. Globally, energy efficiency [4] and renewable sources have ...

However, in recent years some of the energy storage devices available on the market include other integral components which are required for the energy storage device to operate. The term battery system replaces the term battery to allow for the fact that the battery system could include the energy storage plus other associated components.

Battery energy storage is the important component in the off-grid solar PV system. Due to load and PV output variations, battery energy storage is going to have frequent charging and discharging.

It argues that Sudan has great potential to secure a sustainable energy supply by switching to solar, wind, and geothermal resources. The central assumption is that Sudan's diverse sources of renewable energy (RE) are not ...

Different hybridization cases of a solar photovoltaic, wind turbine, diesel generator, battery storage, and converter technologies, together with a diesel generator-based energy ...

Avoiding inefficiencies, such as double charging for grid access, is essential to create fair and competitive markets that attract investors. Partnerships and innovation to generate socio-economic benefits. As the energy storage market matures, fostering public-private partnerships gains more relevance in two key fields.

Similarly, the benefits of bifacial PV modules that are oriented to the east and west were also supported in Baumann et al. [10]. ... based on photovoltaic (PV), diesel generators (DG), and energy storage systems (ESS) are widely used solutions for the energy supply of off-grid or isolated areas. The main hybridizing challenges are reliability ...

Off-Grid Expansion and ApTech Africa. Off-grid expansion could be a major step towards increasing access to and awareness of renewable energy in South Sudan. Distributed renewable energy, or decentralized energy access, ...

Introducing geothermal energy into Sudan's energy mix enhances grid resilience by reducing dependence on hydro and fossil fuel-based power, ensuring a more stable and diversified ...

The FIT program, which is being developed with the support of the UNDP, is expected to encourage grid-connected renewable energy projects as well as off-grid generation. June 16, 2017 Emiliano Bellini

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Somalia's MoEWR tenders for 46 off-grid solar-plus-storage projects in Mogadishu, totalling over 5MWh ... The government department is seeking bids for the design, supply, installation, testing and commissioning of ...

We present an analysis of the benefits obtained from the combined use of the PV system connected to the grid with energy storage, reducing the total energy consumed from the grid. A brief analysis of the demand showed that, for this UTFPR campus, the peak power ...

The off-grid PV system with storage mainly addresses the use of storage technologies with PV for rural applications such as remote villages. As the PV arrays are not grid-connected, a part of the study also deals with the economic comparison of grid extension break-even points and explores the following configurations:

In this article, Muez Ali and Rasha Akel analyze the unintended energy transitions in Lebanon and Sudan, where compounding crises—economic collapse, ...

In fact today using renewable energy to replace the conventional fossil fuels sources can prevent the release of pollutants into the atmosphere and help combat global warming problem. For...

A gravity-based energy storage project in Sudan was among the projects considered in a recent webinar hosted by trade body Solarpower Europe and EU decentralized renewables program GET vest ...

Fig 2: Solar PV application and cost of electricity (Authors'EUR(TM) Construct) It should be highlighted, that, Solar PV technology applications in off-grid mode contributes in a double way to the attainment of the SE4All objective "EUR" increasing both energy access and renewable energy mix. The off-grid energy systems can be defined as an ...

Hybrid power systems (HPS) based on photovoltaic (PV), diesel generators (DG), and energy storage systems (ESS) are widely used solutions for the energy supply of off-grid or isolated areas. The main hybridizing challenges are reliability, investment and operating costs, and carbon emissions problems.

According to a life cycle assessment used to compare Energy Storage Systems (ESSs) of various types reported by Ref. [97], traditional CAES (Compressed Air Energy Storage) and PHS (Pumped Hydro Storage) have the highest Energy Storage On Investment (ESOI) indicators. ESOI refers to the sum of all energy that is stored across the ESS lifespan ...

The power grid in rural areas has the disadvantages of weak grid structure, scattered load and large peak-to-valley difference. In addition, photovoltaic power generation is easily affected by the weather, and its power generation has many shortcomings such as intermittent, fluctuating, random and unstable [8]. Therefore, when photovoltaic power ...

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