



# South sudan grid-scale energy storage

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As South Sudan emerges from the wreckage of civil war, its leaders are beginning to build the nation's electric sector from the ground up. With only a handful of oil-fired power plants and crumbling poles and wires in place, the country is striving for a system that runs primarily on renewable energy and reaches more homes and businesses.

Today, only about 1 percent of South Sudan's 12.5 million people can access the electric grid, according to the state-run utility. Many people use rooftop solar arrays or noisy, polluting diesel generators to keep the lights on; still many more are left in the dark. Those who can access the grid must pay some of the highest electricity rates in the world for a spotty and unreliable service.

Recently, development banks and foreign companies have started backing projects to revitalize infrastructure and boost power generation amid a relatively tranquil time for the eight-year-old country. Most of the new investment has focused in and around Juba--the nation's capital and largest city, with some 403,000 residents.

"There's a lot of wealth that is coming with the peace now," said Jacob M. Deng, director of planning and projects for South Sudan Electricity Corporation, the nation's sole electric utility.

Deng joined the utility in 2010, a year before South Sudan officially split from Sudan. In 2013, the nascent African nation plunged into a brutal conflict that displaced millions of people and left nearly 400,000 people dead. During this time, Deng and his colleagues struggled to maintain the electric system as funding for conductors, insulators, fuses, and engine oil all but disappeared. Fuel suppliers hoarded petroleum, forcing the state-owned power plants to shut down indefinitely, including Juba's 17-megawatt diesel power station.

Meanwhile, ants chomped away at the aging wooden power poles in urban areas. Plans to expand the nation's generating capacity were swiftly shelved. South Sudan had negotiated an agreement with the Norwegian government to build a 43-megawatt hydroelectric dam, but once the war broke out, Norway redirected its funding toward humanitarian aid.

The work to restore South Sudan's electric sector began in earnest in late 2018, after South Sudan's President Salva Kiir reached a peace deal with rebel leader Riek Machar. (Earlier this year, Kiir appointed Machar as vice president.)

Last November, South Sudan Electricity Corporation began operating the first section of Juba's rehabilitated distribution network. Power Construction Corporation of China strung up new 33-kilovolt lines, replacing the city's 11-kilovolt lines, a network that will eventually supply 20,000 additional customers in the capital city. The Chinese firm is also producing 13,450 prestressed concrete poles from a new facility in Juba. The African Development Bank has approved a US \$14.6 million loan for the grid project.

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For now, however, most of Juba's residents are still using their own power supplies to run refrigerators or charge computers. The utility dismantled the old grid, and the upgraded system is proceeding slowly in phases. Deng said his own home likely won't be connected for several more months. The senior engineer instead uses a 360-watt rooftop solar array, which he bought years ago after the city's unreliable electricity kept breaking electronics in his house.

The utility is working to establish or extend interconnections with Sudan, Uganda, and Ethiopia to reach into South Sudan's interior. At the same time, the young country is adding its own generation.

To Deng, diesel-fired generation is not a long-term solution for South Sudan, given the volatile fuel market and diesel's significant contributions to air pollution and greenhouse gas emissions. He said the utility is particularly interested in developing hydroelectric projects to provide the nation's baseload power, while adding solar farms and other renewable projects to supplement demand.

South Sudan's installed power capacity is about 130 megawatts, a large chunk of which is used to supply electricity to the country's abundant oil fields. However, the country's power demand is about 300 megawatts, an amount that's likely to grow during peacetime, Deng said.

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