South africa utility-scale solar

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South Africa"s energy mix is diversifying, with renewables now making up 25% of the country"s total installed generation capacity. The north-western region of the country is endowed with vast tracks of land where sunshine is abundant and intense, particularly in the Northern Cape. This has attracted several independent power producers (IPPs) into the region.

The general idea in solar farming is to collect energy from sunlight and convert it into electricity, but the details of how this is done vary depending on which technology is employed. In the South African context, two types of solar farming technologies dominate in the renewable energy sector: photovoltaic (PV) panels and concentrated solar power.

PV panels are made up of layers of silicon which absorb photons from sunlight and release electrons that generate an electric current. Although PV systems have the advantage that they can scale from small residential installations to utility-scale plants that cover vast tracks of land, the power generated from PV cells generally has to be used or fed into the grid immediately as the cost of storage for this technology remains prohibitively high - for now.

In contrast, concentrated solar power (CSP) farms use mirrors to focus sunlight onto a single point and can store the energy they produce in thermal systems for use at a later stage. CSP farms are only viable in areas with high direct normal irradiation - a measure of the intensity of sunlight - such as the arid regions of the Northern Cape. CSP solar farms that use thermal energy storage systems are also referred to as thermo-solar power plants.

TechCentral conducted desktop research into the largest, utility-scale solar power projects that feed energy into South Africa"s grid as part of government"s renewable IPP programme. These are the 10 largest solar farms, based on installed capacity, in South Africa…

Spread over 850 000sq m near Pofadder in the Northern Cape, this 100MW thermo-solar power plant is the biggest solar power complex in Africa when combined with the adjacent Kaxu Solar One solar power plant mentioned further down the list.

The Xina Solar One plant makes use of cylindrical-parabolic collectors and a thermal storage system to generate electricity. The parabolic concentrators are made of curved mirrors that track the sun and concentrate solar energy onto synthetic oil-filled absorber pipes.

The oil in the pipes is heated to 395?C and transferred to a heat exchanger. The exchanger then heats water to

generate steam, which turns the turbine and generates electricity.

The heat from the oil is also used to heat 47 000t of molten salt stored in thermal energy storage tanks. This system can generate electricity for up to five hours after sunset.

Karoshoek Solar One, also referred to as the "Ilanga" project, is a 100MW CSP plant 30km east of Upington in the Northern Cape. Karashoek also makes use of arrays of curved cylindrical panels, known as parabolic troughs, to concentrate sunlight into a receiver tube that is filled with a heat transfer fluid. The heat transfer fluid heats water into steam, which turns a turbine and generates electricity.

Karoshoek went live in November 2018 and is expected to feed the national grid for the next 20 years or more.

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