



Khi Solar One – bringing clean electricity to over 45 000 South African homes!

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Photo Cred: Khi Solar One

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According to Abengoa, the 50 MW steam-driven solar thermal plant which began commercial operation in February 2016, supplies enough

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clean energy to power around 45 000 South African households.

Upington, South Africa (07 October 2020) – Drive west of the town of Upington, along the N14 in the Northern Cape and all you'll see is desert... but a few kilometres later a tower looms on the horizon, growing inconceivably larger as you approach.

To get to it, you make your way along a bumpy dirt road for five kilometres. And there you are, facing a 200-metre cylinder stretching to the sky, surrounded by more than 4 000 massive, wall-like solar mirrors. You'd think you'd stumbled on the set of a science fiction film but this is Khi Solar One, Africa's first concentrated solar power project.

The 140-hectare plant is the brainchild of Spanish company Abengoa Solar. It produces 50 megawatts (MW) of energy and reduces South Africa's carbon dioxide emissions by about 138 000 metric tons a year.

Abengoa is the project's major investor with a 51% stake, its partner, while South Africa's Industrial Development Corporation (IDC) owns 49% of the project. Both organisations remain mum about the amount they have invested in Khi Solar One. But Abengoa has given some indication of the huge cost of the project: it said both Khi Solar One and KaXu Solar One, also in the Northern Cape, are worth €1-billion (R14.9-billion) combined.

From sun's rays to superheated steam

At the heart of the plant is the hollowed-out superheated steam solar tower. Stretching at 205 metres – taller than Ponte City in Johannesburg – the tower is surrounded by 4 200 concave solar mirror panels. These are tilted at an angle that reflects the sun's rays onto the top of the tower. According to Drewes, each panel has an autonomous computerised control system with a GPS signal that tells it the exact time of day.

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"It determines which angle the sun is at and which angle it should be in for light to be reflected to the top of the tower."

The tower is filled with boiling tubes, painted black to absorb heat from the reflection. These contain high-pressure water pumped from the Orange River. When the sun's rays are reflected onto the tubes, the water heats to boiling point and becomes steam. The steam is heated further, to 500° C, to create enough pressure to turn the turbine and produce electricity.

The tower has a dry-cooling system, an innovation in concentrated solar power, or CSP. The walls, Drewes said, have openings to allow in air, making it both a heating and cooling tower when required.

According to Drewes, CSP is the only renewable energy technology that can effectively store power. Khi Solar One has the longest steam storage capacity – two hours – in the world. Although this may seem short, the advantage of CSP is that supply can be adjusted to meet the demand. If capacity needs to be increased, they do not have to make the tower bigger. They would simply increase the surface of the mirrors, which Drewes said is easy to do.

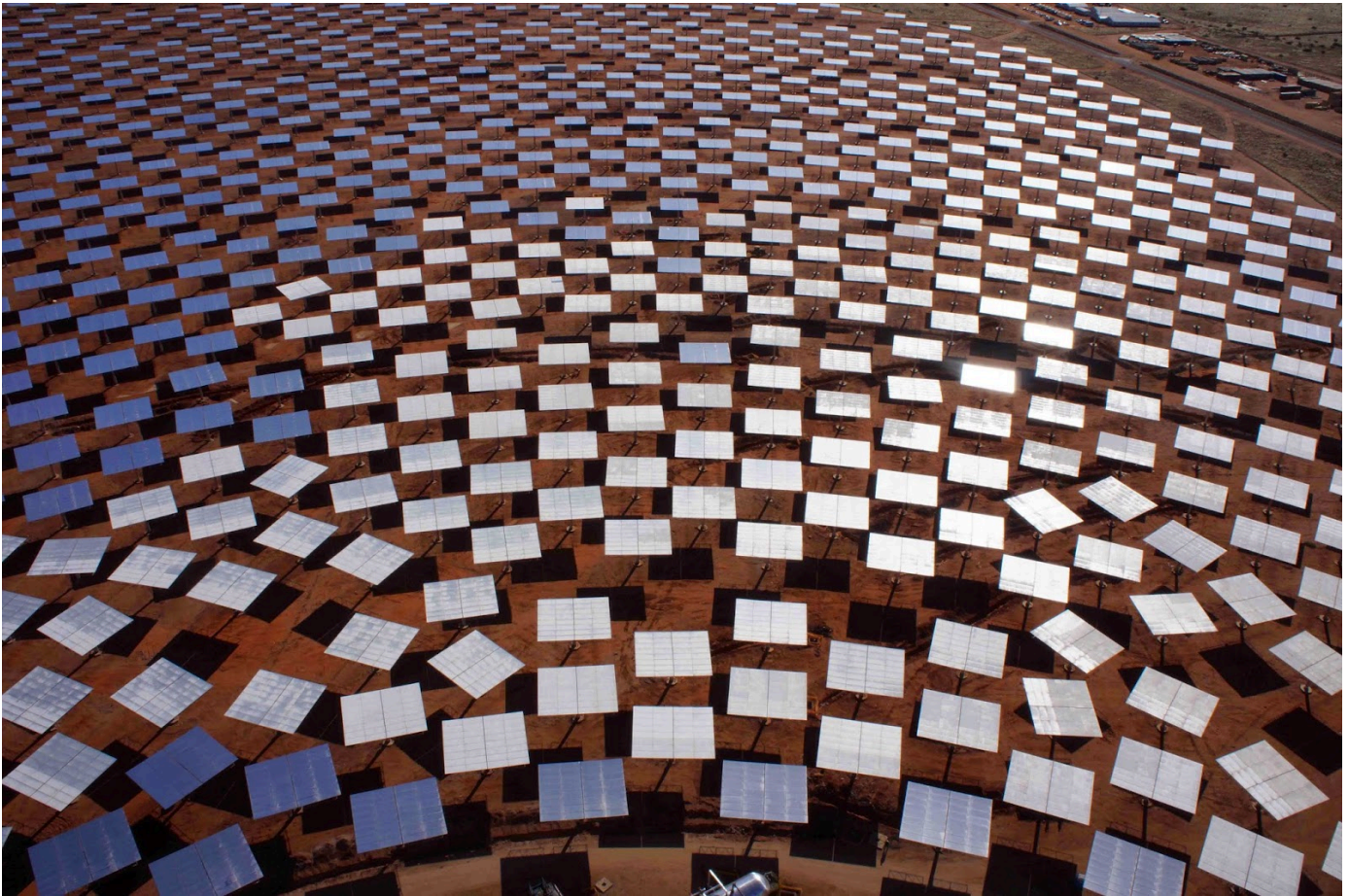
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Spain the leaders in CSPs

According to the renewable energy policy network, REN21, the Spanish are the leaders in CSP technology.

The Iberian nation now has 46 CSPs with an accumulated output of 1 950 MW, way ahead of the US, which is in second place with 507 MW in operation. The report also considered South Africa as one of the most active markets of 2012 thanks to the construction of Khi Solar One and KaXu Solar One.

The Spanish have been constructing CSPs since 2004, the first being in the Andalusian city of Seville, which Abengoa built. But Drewes said since the 2008 financial crisis devastated the Spanish economy, solar companies have ventured outside of Spain for business.

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Drewes said the Spanish construct CSP plants with one idea in mind: to create energy sources able to serve humanity for generations to come. It is an ideal South Africa should apply to all of its renewable energy projects, he said.

“South Africans can learn a lot from the Spanish, who have been constructing CSP plants that would serve for hundreds of years.”

Drewes referred to the Aqueduct of Segovia in Spain, which was built by the Romans 2 000 years ago, as an example of forward-thinking construction. Today, it is still in use and provides water to the old part of Segovia.

“Our engineers should learn from that. We must build something for forever. The term ‘renewable energies’ means it renews itself. It is immortal. The generations that will follow will say, ‘Thanks, chaps, for giving this to us.’”

He added that although Spain has been one of the economies hardest hit by the economic downturn, it still invests heavily in renewable energies for the benefit of future generations.

“They know there will come a time when this financial crisis is over, and the next generation will have a greater industrial capacity because of lower energy costs.”



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