

Khi Solar One, South Africa

50 MW



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John Cockerill's first thermo solar receiver

Project Description

The main fuel used in South Africa is coal, which is not the most environment-friendly solution. Political decisions have therefore been taken in the country to support the development of renewable energies. A vast area has been allocated to solar energy in the region of Upington (Northern Cape Province), an ideally sundrenched region in the south of the Kalahari Desert. In 2012, Abengoa Solar was selected for the 50 MWe Khi Solar One project, the first Central Tower for Solar Thermal Electricity (STE) in Africa. This plant is now in commercial operation and provides clean and sustainable electricity to 65,000 homes, preventing the emission of 185,000 tons of CO₂ every year.

The contract

The Spanish company Abengoa Solar entrusted the order to John Cockerill Energy for the design and supply of the central solar receiver for this Khi Solar One power station.

This plant is a direct steam generation plant, meaning that the high pressure superheated steam feeding the steam turbine is directly produced in the solar receiver, allowing the best efficiency. Some saturated steam is also stored to allow electricity generation when the sun is not shining.

John Cockerill's solar receiver consists of three cavities: two natural circulation evaporators in the western and eastern parts and one superheater south. Its design is based on John Cockerill's development launched in 2008 upon request of Abengoa. The aim was to design a solar receiver capable of generating superheated steam at 130 bars and 530°C.

Special care is needed to cope with the fluctuating load due to the sunshine variations and to daily start-ups and shut downs of the plant.

Plant operation

The Khi Solar One power plant was designed for cycling operation, depending on the sunshine. The saturated steam is stored to compensate the lack of sunshine during a few hours.

Characteristics

- Heat transfer fluid: water/steam
- Central tower STE receiver, one pressure
- Superheated + saturated steam for heat storage
- Natural circulation

Equipment

Absorbed power (MWth)	Molten Salt Flow (t/h)	Molten Salt Inlet/Outlet pressure (bara)	Molten Salt Inlet/Outlet temperature (°C)
250	235	120	235
250	105	130	Saturated

Schedule

- Contract Award May 2012
- Commercial Operation February 2016



CMI becomes John Cockerill

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