



Boosting Eskom's Potential Session G1

AREVA Solar

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AREVA Solar is maintaining, constructing and developing projects in all application types



Kimberlina: first CSP plant commissioned in the USA in 20 years (5 MWe)



Construction of a large-scale, high-temperature CSP plant (2x125 MWe)



Construction of world's largest coal/solar booster (44 MWe)



Construction of high-temperature booster demo for additional applications (5 MWe)



AREVA Solar currently has more than 300 MW of CSP projects in operation and under construction, making it the fastest-growing CSP technology provider.

Sundt Solar Boost Project: world's latest solar steam augmentation of a dual-fueled gas-coal power plant



- ▶ **What** AREVA solar superheated steam addition for feedwater heating to Sundt's 156 MW dual-fueled, coal/gas-fired Unit 4 in Tucson, AZ- USA
- ▶ **Who** Tucson Electric Power and AREVA Solar
- ▶ **Capacity** 5 MWe net peak additional solar capacity; this will equate to coal saving of 3,600 tons/year
- ▶ **How** US Investment Tax Credit (ITC) and TEP's [REST](#) funding

Kogan Creek Power Station: world's largest solar steam augmentation of a coal-fired power plant



- ▶ **What** AREVA solar superheated steam (370°C / 81 Bara) addition via cold reheat line to existing 750 MW Kogan Creek Power Station in Queensland, Australia
- ▶ **Who** CS Energy and AREVA Solar
- ▶ **Capacity** 44 MWe net peak additional solar capacity from 30 hectares; this will equate to 40 gigawatt-hours of solar electricity per year.
- ▶ **How** Capital grants contributions from [Commonwealth and Queensland Government](#)

Eskom Steam Booster Matimba's 100 MWe Case Study (1/2)

► **Eskom owns and operates a fleet of coal fired power plants that are ideal candidates to host a booster solution.**

- ◆ Matimba Power Station neighboring land constraints can accommodate up to 15 SSGs so 5 x 3 boosting of each 665 MW unit ~ 106 MWe net solar boost.
- ◆ Coal 3, Kusile, Medupi, Majuba, Lethabo, Kendal, Duvha, Tutuka, Matla are similar active prospects.

	Value	Remarks
Number of AREVA Modules (SSG)	15	Each AREVA SSG is ~7 MWe at design. Actual number of modules depend on the DNI.
Estimated Project Capital Cost	R 1.5 Billion	COD Q2 2015: full project development and construction schedule < 33 months
Capacity Factor	14%	This factor can be increased based on the economics of the project and the DNI.
Equivalent 1 st yr PPA price for the solar boosted electricity	< R 1.5 /kWh	This does not account for the reduced O&M due to reduced coal usage on the coal plant.

Capital Cost < 15,000 R/kWatt: better than any PV or standalone CSP Power plant



LCOE well below PV!



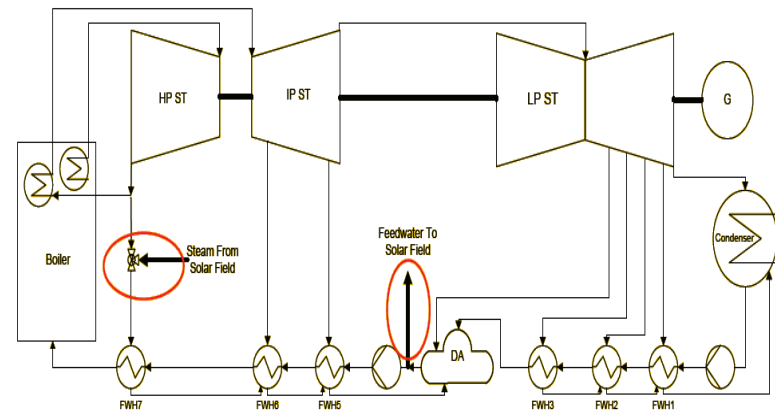
Eskom Steam Booster Matimba's 100 MWe Case Study (2/2)



**Matimba Plant indicative Site Layout
15 SSGs option for 5 units boosting**



**Indicative solar steam integration
performance at Matimba plant's cycle**



Annual Thermal Energy	456065 MWt/yr
Peak Thermal Energy	381.75 MWt

Gross Annual Electrical Energy	136819.5 MWhe/yr
Annual Parasitic Energy	7536.75 MWhe/yr
Net Annual Electrical Energy	129282.75 MWhe/yr
Peak Net Electricity Boost	106.5 MWe
Capacity Factor	13.9%

Input DNI	6.33 (kWh/m ² -day)
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Feed Water Temperature	250.0 deg C
Feed Water Pressure	200.0 bar
Steam Supply Pressure	390.0 deg C
Steam Supply Temperature	161.0 bar
Thermal to Electric Conversion Efficiency Assumed	30.0%

AREVA Solar: a Bankable Solution in Republic of South Africa

▶ Best-in-class technology and EPC services

- ◆ **Technology assessed by independent industry expert and international standards and adopted by blue chip customer**
 - 300 MWe in operation and construction with groundbreaking project announcement in Australia, US and India.
- ◆ **Performance backed by AREVA**
 - Unique capacity to provide balance sheet guarantees and warranties to support non-recourse funding.
- ◆ **Lesedi Nuclear Services (AREVA subsidiary) crafted EPC consortium contract structure**
 - Meeting Eskom ASGISA / SD&L requirements
 - Level 4 BBBEE accredited company (300+ employees today)
- ◆ **Life-cycle services for long-term operations and maintenance**
 - Fully integrated and demonstrated technology delivery package.
 - Technology provider that will still be there in 10-20 years to ensure life-cycle services for long-term operation and maintenance of plants.

▶ Strong local relationships with multilateral - bilateral investment bankers as well as export credit agencies

- ◆ **AREVA Solar is able to expand its operations by building on the solid foundation of relationships and the success of the nuclear group activities in RSA continuously present since 1975 to support Eskom.**
 - Structured finance package of \$4B had been put together in anticipation of a nuclear project proceeding.



Solar Simplified
AREVA SOLAR

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