



Status of CSP and its future in the South African energy mix

Dr. Louis van Heerden (Chairman, SASTELA)

- ❖ The Southern Africa Solar Thermal and Electricity Association (**SASTELA**) represents industry involved with electricity and heat generation using solar concentrating systems.
 - ❖ Established in 2010.
 - ❖ The Association currently comprises 16 world leading engineering, construction and CSP companies.
 - ❖ Founding member of the World Solar Thermal Electricity Association (STELA-World) and member of the South African Renewable Energy Council (SAREC).

SASTELA's – Objectives

- ❖ Promote the roll out of **CSP Power Stations** for the production of sustainable **peak**, **mid merit** and **baseload** solar thermal electricity in Southern Africa.
- ❖ Highlight and support the use of **solar steam** for industrial applications.
- ❖ Promote CSP in Southern Africa at policy and administrative levels (local, national, regional & international) aimed at harnessing the region's vast **Solar Resource**.
- ❖ Promote the **manufacture and industrialisation** of **CSP components** in Southern Africa, where SADC **countries** can manufacture different CSP components for Solar Thermal Power Stations.
- ❖ Contact: Ms Ntombikanina Malinga, CEO, sastela@vdw.co.za

Status of CSP in South Africa - programmes



- ❖ Department of Energy,
Renewable Energy
Independent Power
Producer Programme



- ❖ Eskom, CSP Programme

Status of CSP in South Africa – IPP Programme

BW1	BW2	BW3	BW3.5	BW4	Expedited
· 28 Preferred Bidders	· 19 Preferred Bidders	· 17 Preferred Bidders	· 2 Preferred Bidders	· 26 Preferred Bidders	· Bid Nov '15
· 1425MW allocated	· 1040MW allocated	· 1456MW allocated	· 200MW allocated	· 2205MW allocated	· 1800MW available
· 150MW CSP	· 50MW CSP	· 200MW CSP	· 200MW CSP	· 0 CSP	· 450MW CSP

- ❖ Some 6326MW of RE in total selected as Preferred Bidders in the DOE programme.
- ❖ 600MW CSP selected since 2011. 150MW being towers and 450MW parabolic troughs.
- ❖ CSP < 10% of allocation.

Status of CSP in South Africa – IPP Programme

	Pre-IPP and 2010 IRP	Current status
Knowledge of CSP	Limited	Extensive, finance, construct, operate
Projects	One only - Eskom CSP proposed and permitted (2007)	600MW in various stages
Acceptance by Financing Institutions	Considered high risk; limited acceptability	5 Projects reached FC
Proven in South Africa	No	Yes; Kaxu Solar One, constructed withinin schedule and budget. Almost 8 months of commercial operation

- ❖ 450MW allocated for Bid on 11Nov. Represents 25% of overall capacity on Bid.

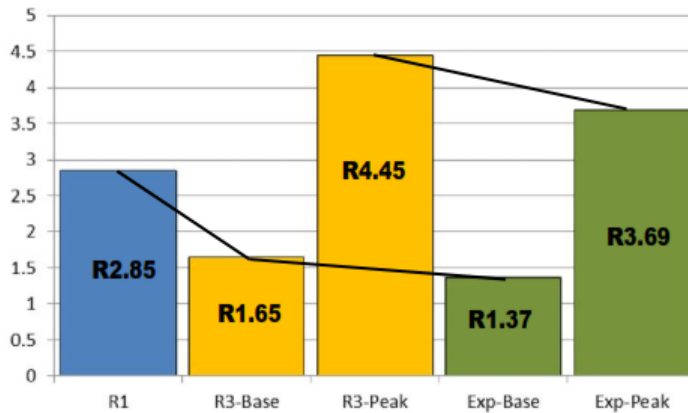
Status of CSP in South Africa – Projects

Operation	Construction	Pre-construction	Financing
100MW Kaxu Solar One	50MW Khi Solar One	100MW Ilanga CSP 1	100MW Redstone Solar Thermal Power Project
	50MW Bokpoort CSP Project		100MW Kathu Solar Park
	100MW Xina Solar One		
100MW	200MW	100MW	200MW

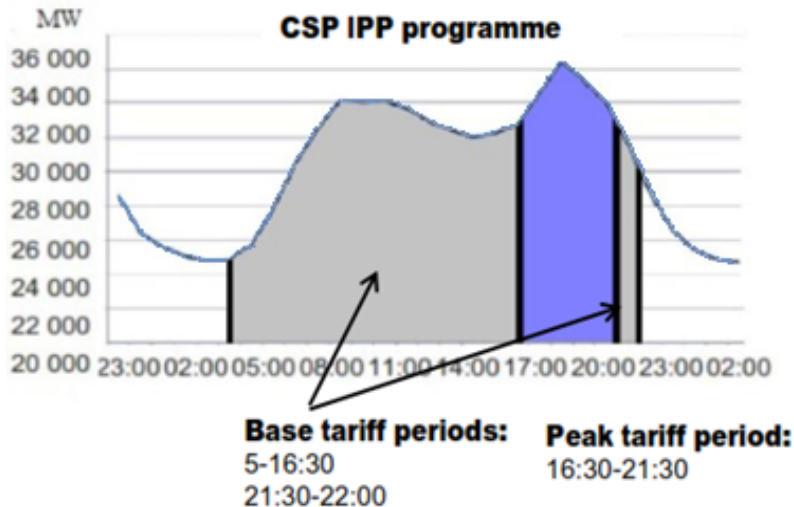


Status of CSP in South Africa – Tariffs

IPP CSP Tariff Hurdles



- ❖ CSP tariffs have **decreased significantly** from Round 1 to the 2015 Expedited Round.
- ❖ Current tariff is a reduction of 17% from R3. If the ZAR exchange rate impact is further considered, this decrease translates to some **30%**.
- ❖ The procurement emphasis had moved to the most value add by CSP; **producing competitive peak power** from 16:30 to 21:30, when electricity demand is the highest in South Africa.
- ❖ PPA conditions are still not ideal for an integrated, dispatchable, renewable / conventional hybrid:
 - Size limited to 150MW (has however been increased from 100MW)
 - PPA duration = 20 years. Does not reflect the economic life of a CSP plant



Summary and conclusions



1 CSP Demo Plant

- Delays in procurement but commercial process has begun. Construction to commence in 2016.

Concentrating Solar Power in Eskom

STERG Symposium: 17 July 2014

2 Eskom Solar 2 & 3

- EIA to commence shortly on Eskom owned land. Strategic partnership to be explored.

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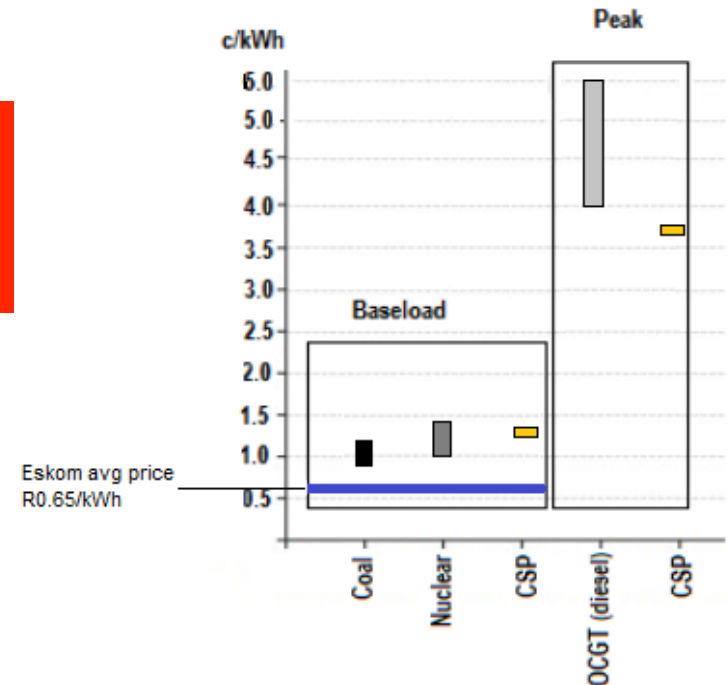
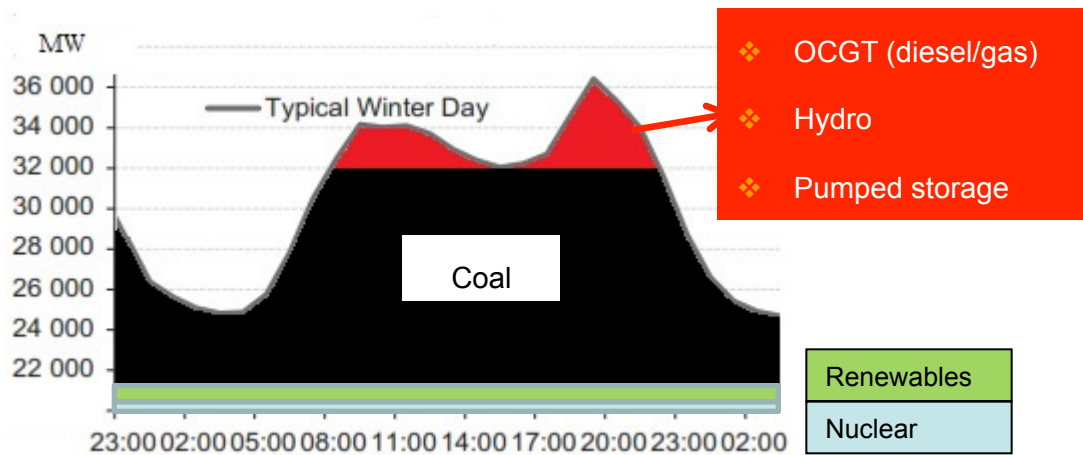
3 Solar Augmentation

- Studies commenced. Concept designs delayed due to site verification / suitability studies. To be complete by end 2014. Execution timelines dependent on partnerships.



Current position of CSP

South Africa generation options



- ❖ CSP is a **renewable / conventional hybrid**.
- ❖ It is **dispatchable**. Lowest LEC found with a significant storage volume.
- ❖ CSP is scaleable and can provide **large power generation** units
- ❖ Comparing the Round 3.5 CSP and new target tariffs with LEC numbers for other conventional technologies (e.g. coal, nuclear) shows that CSP is cost competitive with conventional options, if CSP is viewed as an Integrated Generation Option providing both Baseload and Peak electricity.

Future of CSP in South Africa

Technology options arising from IRP 2010 and the Update Base Case in 2030

Technology option	IRP 2010 (MW)	Base Case (MW)
Existing Coal	34746	36230
New Coal	6250	2450
CCGT	2370	3550
OCGT / Gas Engines	7330	7680
Hydro Imports	4109	3000
Hydro Domestic	700	690
PS (incl Imports)	2912	2900
Nuclear	11400	6660
PV	8400	9770
CSP	1200	3300
Wind ³	9200	4360
Other	915	640
TOTAL	89532	81350

Updated IRP
Potential CSP increase
3300MW

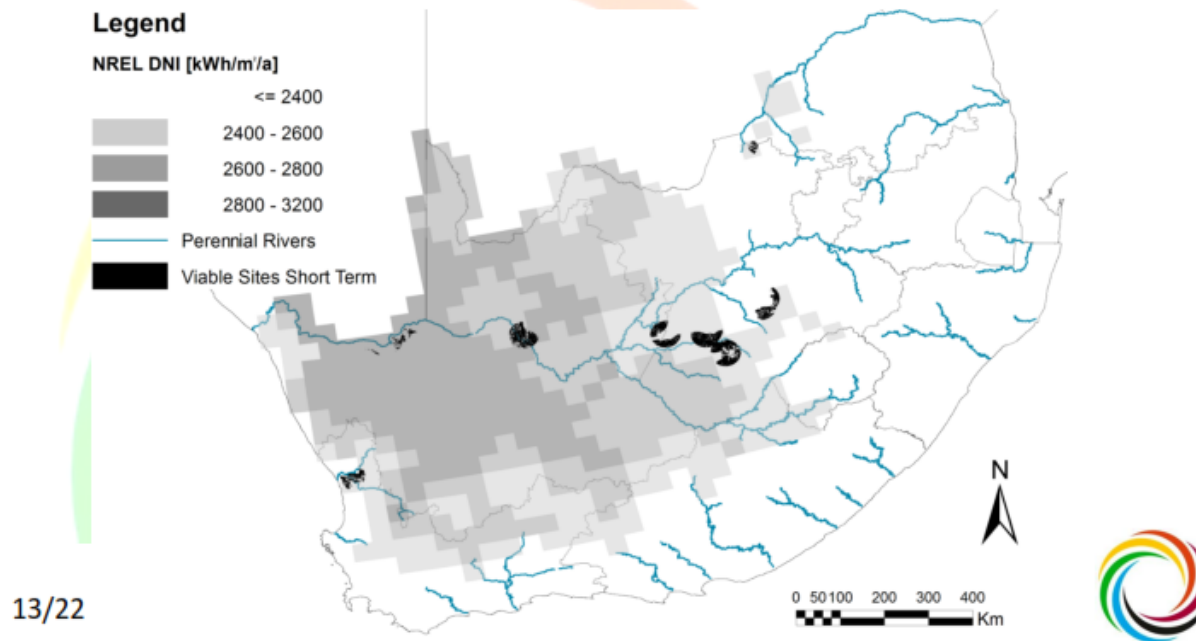
- ❖ 600MW allocated – 450MW available – 200MW remaining under IRP 2010-2030
- ❖ Updated IRP critical to future implementation.
- ❖ IPP Programme to introduce changes in 2016.
- ❖ Changes could be:
 - Hybridisation
 - Increased local content and local labour requirement, also EDO
 - Increased requirement for stability, availability and predictability

Results – Short Term

The viable areas far exceeds the capacity at each substation. The black areas shows the viable CSP locations. The total CSP capacity (assuming parabolic trough plants with 7 hours of thermal storage) is 262 GW.

Mapping South Africa's DNI
What is South Africa's CSP potential?

Mr AJ (Riaan) Meyer
Prof JL (Wikus) van Niekerk



- ❖ Considering the solar resource and land availability, CSP can play a significantly larger role than currently envisaged by the updated IRP.

Future of CSP in South Africa

- ❖ Government has shown **significant commitment to renewables** through Four Rounds of the RE IPP programme. This is a clear commitment to the future and we expect the IPP programme to continue. What the industry does, however, need is a firm **programme schedule going forward**, to enable planning and investment to reduce costs further.
- ❖ Given decreases in the cost of CSP, the potential to obtain further cost reductions and the contribution that CSP could make as an Integrated Generation Option, we **expect the allocation to CSP to increase in the future**.
- ❖ **CSP has the potential for large scale manufacturing, industrialisation and localisation** and this will have to be pursued, which will support government to meet the objectives of IPAP and the Black Industrialisation Policy. Good example: Stellenbosch University Helio 100, 100% South African heliostat system.
- ❖ The ability to connect to the Eskom **Tx network is a constraint**. The 2015-2024 TDP contains the expansion of the network around Upington but does not support development in other areas. Future Tx IPP investments?



DOE IPP Procurement Programmes

- ❖ The Coal Baseload IPP Procurement Programme aims to procure 2 500MW of electricity from coal fired power stations with individual bids capped at 600MW per project.
- ❖ The Cogeneration IPP Procurement Programme has been designed to procure the target of eight hundred (800) MW of energy generation capacity from Cogeneration.
- ❖ The Department is to procure 3126MW of new generation capacity from gas-fired power generation.
- ❖ No dedicated CSP Procurement programme exists. **Industry will continue to participate and grow** through the current RE IPP programme, but a **GW scale programme, with multiple projects per Bidder** will make CSP cost competitive with all options, and justify investment that will enable local manufacturing of components and large-scale industry creation.