



The Case for Solar Augmentation in South Africa

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Workshop: The Role and Value of CSP in the South African
Power System, CSIR Tshwane

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Outline

- Solar what?
- Rationale
- Case Study
- Real World
- Value to South Africa

Solar what?

- Solar Aided Power Generation (SAPG)
 - Arose by any other name... solar assisted power generation, solar boosting, solar augmentation, etc.
 - CSP meets Coal: solar field (collectors) integrated into a conventional fossil power plant
- EPRI, NREL, ARENA, AREVA, Novatec, ESKOM, AURECON
- Liddell – 9 MW_t
- Kogan Creek – 44 MW_e (how did that work out?)



Rationale

- Solar meets Coal
- Hybrid (together we can do more)

	Coal	Solar (CSP)
pros	<ul style="list-style-type: none">• affordable• reliable• dispatchable• mature (low risk)• large scale	<ul style="list-style-type: none">• clean• free fuel• (storage optional)
cons	<ul style="list-style-type: none">• GHG emissions (“dirty”)• coal is not free	<ul style="list-style-type: none">• expensive• less mature (higher risk)

Case Study (2014)

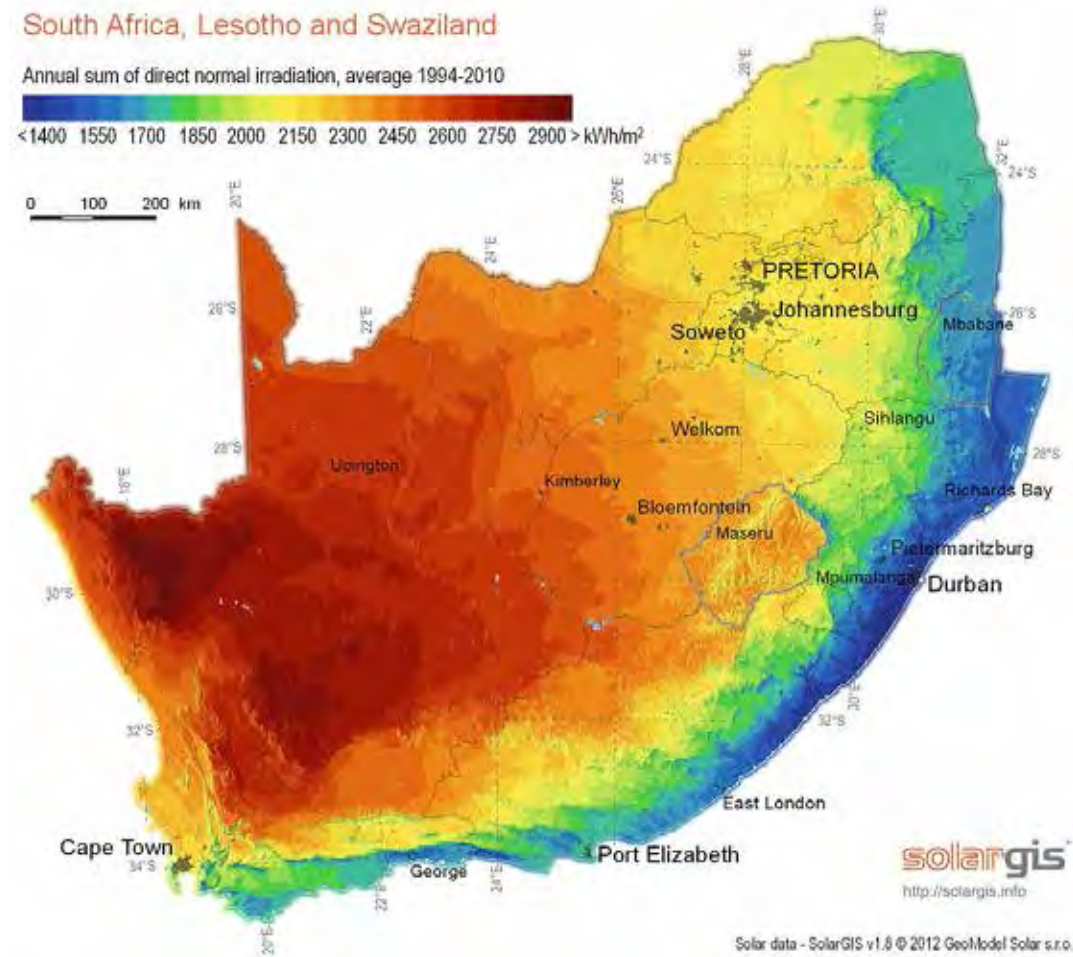
- IF stand-alone CSP is being considered in South Africa
AND SAPG is as viable as stand-alone CSP
THEN SAPG should also be considered
- Winners? Losers?



SAPG vs stand-alone CSP

- What are the constraints/limitations of SAPG?
- SAPG at Matimba vs
- Stand-alone CSP Upington

	DNI annual total kWh/m ² .a
Lephalale	2,250
Upington	2,820
difference	-20%

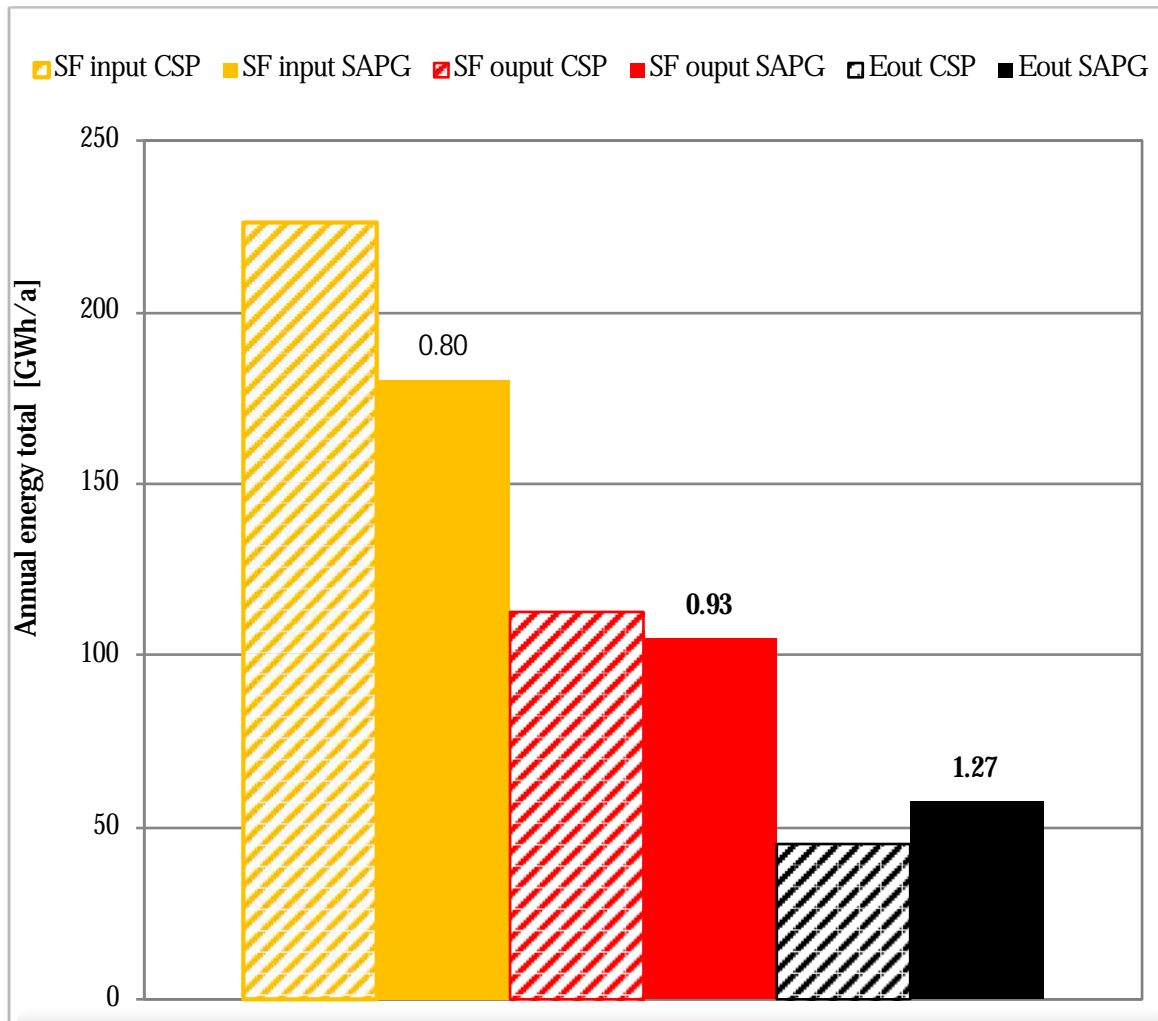


SAPG vs stand-alone CSP (2)

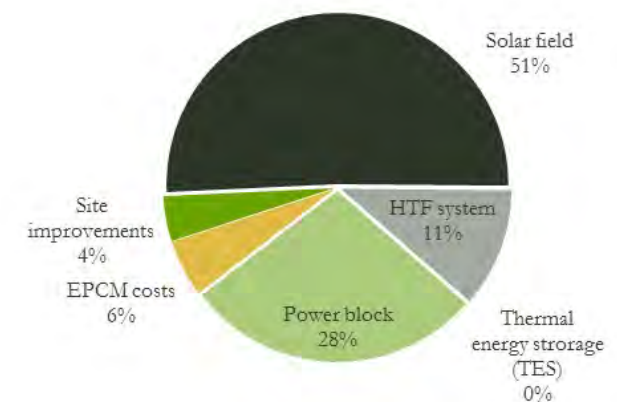
- Parabolic Trough 50 MW_t
- Final FWH
- Boosting mode



Results



- SAPG 1.27 times more electricity into the grid
- If SAPG cost taken as 72% of stand-alone CSP => 1.8 times more cost effective
- better performance in high demand months (SA winter)

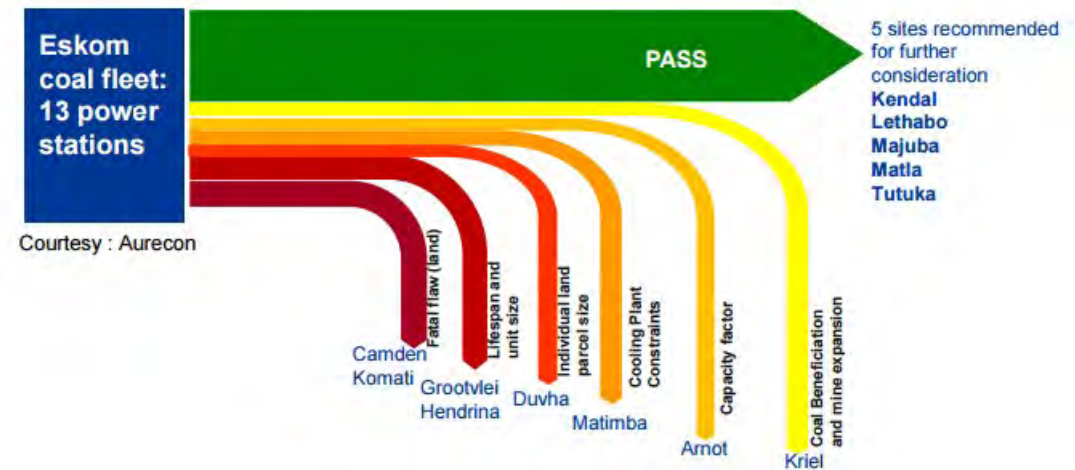


Real World

- Academic meets Life
- No compromise on availability or reliability of the plant!
- Risk adverse environment
- Objective is optimal economic configuration, considering:
 - solar technology
 - integration
 - impact on host plant, O&M
 - environmental and political mandates

Real World (2)

- Technically it is possible
- But there are barriers/limitations
 - Land (it's a big one)
 - Is there a business case?
 - Substitutes?



Courtesy : Aurecon

Value to South Africa

- Option for policy makers to increase RE (reduce GHG, fossil dependency)
- Leverage/"green" existing infrastructure and scale benefits (reduce costs increased efficiency)
- Zoning, EIA, grid connections, licenses already in place (reduce costs)
- Closer to loads and manufacturing industry
- Benefits to host plant (reduce GHG, reduce coal need and ash production, extend life span)
- Dispatchable power

Value to South Africa – key questions

- Does SAPG fall under CSP or Coal?
- Whose mandate/responsibility is it to promote SAPG?
- Is the value/fate of SAPG directly coupled to CSP's?
- Is the stepping stone argument still valid?
- What impact does SAPG have on CSP's storage drawcard?
- Substitutes – which options and/or (price) signals could provide the same benefits for the similar or lower costs?



Substitutes – which options and/or (price) signals could provide the same benefits for the same or lower costs?

*Bringing ideas
to life*

Value to South Africa

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Value to South Africa – key questions (2)

- Does SAPG fall under CSP or Coal?
- Whose mandate/responsibility is it to promote SAPG?
- Is the value/fate of SAPG directly linked to CSP?
- Is the stepping stone argument still valid?
- What impact does SAPG have on CSP's storage drawcard?
- Substitutes – which options and/or (price) signals could provide the same benefits for the same or lower costs?
- How to lower barriers/promote SAPG?
 - Should SAPG not be included/allowed under new-build Coal IPP PP?
 - This would sponsor the market to compete
 - drives efficiency/optimisation → lowers cost of required service

Thank you for your attention



*Bringing ideas
to life*



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