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

Monday 16 January 2017
Onyx Room CSIR Convention Centre

CONSENSUS STATEMENT

A high-level delegation from academia, the research community, industry and civil society met in Pretoria to discuss "The Role and Value of Concentrating Solar Power (CSP) in the South African Power System." This workshop was partly in reaction to the fact that in the recently released Draft Integrated Resource Plan 2016 (Draft IRP2016) there was no allocation made for CSP in the SA electricity generation mix up to 2050. This seems to have been based on modelling assumptions that are outdated, do not reflect the current market reality, and do not acknowledge the dispatchability and operational flexibility of CSP power stations. The aim of the workshop was to discuss and debate the value of CSP technology and the contribution it could make to the SA Power System.

At the workshop the results of a number of studies completed in South Africa, the United States and Germany, some specifically for the South African power system, were shared that highlighted the value of CSP in the SA power system. The presentations can be found here (web address).

After robust debate the participants agreed on the following:

CSP technology can play a significant role in a cost optimised South African power system based on technical merits, with the added value that CSP provides. The following points support an appropriate allocation of CSP in the IRP 2016.

- CSP, with integrated thermal energy storage, provides locally resourced **dispatchable and flexible electricity** that complements other variable electricity generation allowing higher penetration of low cost electricity from wind farms and PV plants.

- The **price of CSP electricity** is coming down globally and could reach 90c/kWh (6US$cents/kWh) by 2030. Similar cost reductions could be expected in SA with a sufficiently large allocation in the SA IRP.

- The current **cost assumptions** for CSP in the IRP modelling is not aligned with the actual price in the RE IPP *Bid Window 4 Expedited* round. The input for the IRP modelling assumed a cost of R 2.34/kWh and only reduces to ~R 2.20/kWh by 2030 while the average price in BW 4 Expedited for CSP was already ~R 2.00/kWh (based on a base tariff of R 1.25/kWh).

- The **South African CSP industry** has advanced to a stage of maturity with demonstrated increases in local content of CSP plants beyond the REIPPP programme goals. An appropriate allocation of CSP is required to sustain the local industry.

- **LCOE is an incomplete measure** when comparing technologies with different flexibility attributes as it does not capture the full value of flexibility to the power system.

- CSP must be **modelled as a flexible electricity generator**, as is the case of most other system-dispatch technologies (OCGT, CCGT, coal, etc.), to capture the full value that it could provide to the SA power system.

- CSP will **reduce the exposure to the risk of cost escalation** of imported diesel, natural gas, and/or locally sourced shale gas. The price of imported diesel and natural gas may be volatile due to the fluctuation of the international price of gas/oil as well as the Rand/Dollar exchange rate.

- A number of studies were presented at the meeting which investigated the South African power system, using different methodologies and parameter assumptions. The outcomes independently indicate that in all cost-optimised scenarios there is **no requirement to build new coal or nuclear plants** in South Africa.

- There are additional **macro-economic benefits of CSP** such as foreign direct investment, local industrialisation of the technology, reduction of CO_2 emissions, local economic development and job creation which are not included in the system value of CSP. The REIPPP has attracted an investment of R192 billion for energy infrastructure in Bid Windows 1, 2, 3, 3.5 and 4. Of the R192 billion invested to date as much as R53 billion came from the 7 CSP projects (600 MW) approved to date. (The overall benefits of CSP should be quantified in more detailed macro-economic studies.)

The participants trust that the points raised in this consensus statement will be carefully considered by the Department of Energy as well as Eskom in the current process to finalise the IRP 2016 as well as any further decisions on the composition of the future South African generation mix.

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PROGRAMME

	Topic	Presenter/s
08h30	Arrival and Coffee	
09h00	**Welcome and Introductions**	**Wikus van Niekerk – Stellenbosch University**
09h10	**CSP Cost Reduction: How to Achieve SUNSHOT Goals**	**Mark Mehos – NREL (USA)**
09h40	**What is the Role of CSP in the Future South African Electricity System with CO_2 Emission Targets?**	**Julia Badeda – RWTH Aachen University**
	The System and Marginal Value of CSP in the SA IRP Time Horizon: The WWF SA Scenarios and NamPower Macroeconomic Study	**Paul Gauche – Stellenbosch University**
11h00	Tea Break	
11h00	**Least Cost Capacity Expansion of the South African Power System and Resulting Cost Tipping Point for CSP**	**Tobias Bischof-Niemz – CSIR**
12h20	**Operations of a CSP Plant in South Africa**	**Nandu Bhula – ACWA Power**
12h40	**The value of CSP in the context of economic development and job creation in SA**	**Julian Lopez – Abengoa Solar**
13h00	Lunch Break	
14h00	**Current Status of CSP in the South Africa RE IPP Procurement Programme**	**Gary Loyd – DoE's IPP Office**
14h20	**Solar energy in the electricity System of South Africa: Linking Detailed Technology Modelling with a Large-scale Energy System Model**	**Christoph Kost et al. – Fraunhofer ISE (Summary presented by Paul Gauché)**
14h30	**The Case for Solar Augmentation in South Africa**	**Warrick Pierce – Stellenbosch University**
15h00	**General Discussion**	
16h00	Coffee Break	
16h20	**Workshop Wrap-Up and Way Forward**	
16h30	**Closure and Departure**	
17h00	**Cocktails**	

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LIST OF PARTICIPANTS

Organisation	Delegates who attended
Stellenbosch University • Centre for Renewable and Sustainable Energy Studies • Solar Thermal Energy Research Group • Eskom Power Plant Engineering Institute – Specialisation Centre in Renewable Energy	**Prof Wikus van Niekerk** **Dr Paul Gauche** **Warrick Pierce** **Prof Frank Dinter** **Oelof de Meyer**
National Renewable Energy Laboratory (NREL) • Thermal Systems R&D DLR (German Aerospace Center) • Institute of Solar Research RWTH Aachen University	**Mark Mehos** **Prof Dr Robert Pitz-Paal** **Julia Badeda**
CSIR • Energy Centre	**Prof Dr Tobias Bischof-Niemz** **Crescent Mushwana** **Jarrad Wright** **Shanley Lutchman** **Robbie van Heerden**
Abengoa Solar	**Julian Lopez**
ACWA Power	**Nandu Bhula**
DoE's IPP Office	**Gary Lloyd**
SASTELA	**Pancho Ndebele**
TSK	**Rafael Lapique**
WWF	**Ellen Davies**
Cobra	**Luis Pascual Escudero**