Comments by STELAWorld
to the Integrated Resource Plan Assumptions and Base Case
PUBLIC CONSULTATION WORKSHOP
Gauteng, 7 December 2016

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World Solar Thermal Electricity Association

STELAWorld is the common platform of Solar Thermal Electricity (STE/CSP) Industry Associations in:

Europe	South Africa	Chile	Australia	USA	Spain
ESTELA	SASTELA	ACERA asociación chilena de energías renovables a.g.	AUSTELA Australian Solar Thermal Energy Association	CSPA Concentrating Solar Power Alliance	PROTERMO SOLAR

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STELAWorld is deeply concerned by the DoE proposal disregarding CSP as a relevant contributor of the future South Africa generation mix.

The IRP from DoE seems to be biased in its assumptions and is certainly not aligned with the **International Energy Agency Technology Roadmap** presenting STE/CSP as the dominant generation technology for Africa in the future.

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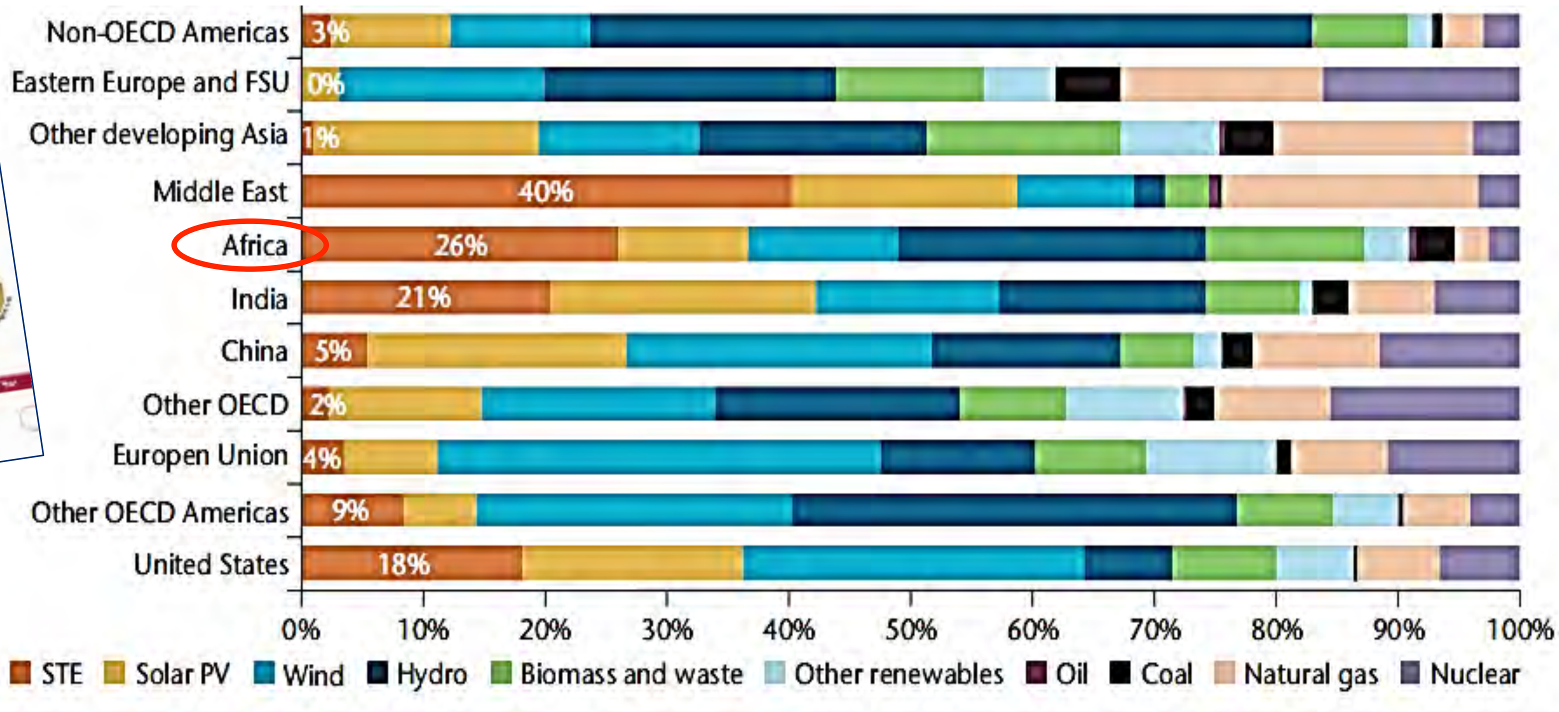


SA is one of the most sunny places on earth and SA Government should use this resource!

STELAWorld main concerns

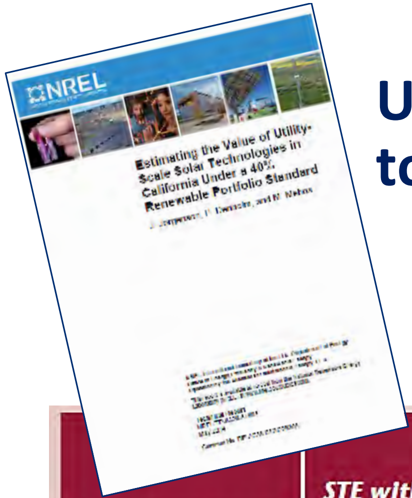
FIRST: Two severe conceptual shortcomings in the IRP approach

1. Considering only LCOE and not the **“value” provided to the system** by each technology as the main criteria to optimize the generation fleet is wrong

   This leads to build up a system that just **seems in the first phase cheaper** but that **will be affected by very expensive operating dysfunctions** as the value of non flexible technologies diminishes as their penetration in the system mix increases.

2. Considering that a system (base case) with **60 % of inflexible generation technologies** (PV, Wind and Nuclear) is feasible, is wrong both technically as well as regarding the resulting business cases for investors

   Having a completely unbalance (between dispatchable and non dispatchable renewables) will lead to a lot of curtailments, to a low capacity factor and – correspondently – to a **high cost for backup** plants, to **further investments in frequency and voltage control** - see the example of U.K. – as well **as inertia and spinning reserve**, etc.



Understanding the value of solar power according to the renewable electricity penetration share

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Example for 33% and 40% RE shares in California (NREL, May 2014)

http://www.nrel.gov/docs/fy14osti/61685.pdf

Value component	33% renewables		40% renewables	
	STE with storage value (USD/MWh)	PV Value (USD/MWh)	STE with storage value (USD/MWh)	PV Value (USD/MWh)
Operational	46.6	31.9	46.2	29.8
Capacity	47.9-60.8	15.2-26.3	49.8-63.1	2.4-17.6
Total	94.6-107	47.1-58.2	96.0-109	32.2-47.4

Conclusion:

It is equivalent - for the total cost of the system- to pay 50 USD/MWh to PV or 100 USD/MWh to CSP/STE with storage. This difference will increase as RES penetration further increases!

- **What does operational value mean:**

  Operational value represents **the avoided costs of conventional generation** at their respective dispatching times along with related ancillary services costs, such as spinning reserve, etc. Savings on emission costs are also accounted

- **What does capacity value mean:**

  Capacity value reflects the **ability to avoid costs of building new conventional generation** in response to growing energy demand or plant retirements

STELAWorld main concerns

SECOND: IRP assumptions regarding CSP current costs and trends

1. As dispatchability of the renewable generation mix is a must nowadays, the following facts has to be taken into account for a generation mix in 2030 – e.g. that needs to be constructed today

   Generation **costs of CSP with 6h storage is much cheaper than of PV + 6 hours battery storage**. And it will continue to be so in the (at least) next 10 years!
   "Don't compare apples and pears" - CSP can deliver base-, mid- and peak load on demand!

2. **The IRP assumptions on current costs for CSP plants are by far no longer valid**!

   Just as the dramatic cost reduction in the last months for PV and wind in different countries were **not driven by technological breakthroughs but by competition in a larger market volume**, the same is happening with CSP. This becomes a matter of evidence when taking into account that there are **only 5 GW installed in CSP plants** in the world to be compared to 500 and 300 GW respectively for wind and PV! The **cost reduction potential in CSP is still very high!**
   How was the cost level for PV and wind when these had about 5 GW installed?

   In a recent auction in Chile **CSP was offered for c$ 6,4/kWh (ZAR 0.9/kWh)**. Next tender in Dubai expressions of interest have been received of a **200 MW CSP plant under c$ 8/kWh (ZAR 1.1/kWh)**

Generation costs for a system with 6 hours of storage will remain lower at least until 2030 for CSP than for PV + batteries


NREL

Exploring the Potential Competitiveness of Utility-Scale Photovoltaics plus Batteries with Concentrating Solar Power, 2015–2030

David Feldman, Robert Margolis, and Paul Denholm
National Renewable Energy Laboratory

Joseph Stekli
U.S. Department of Energy

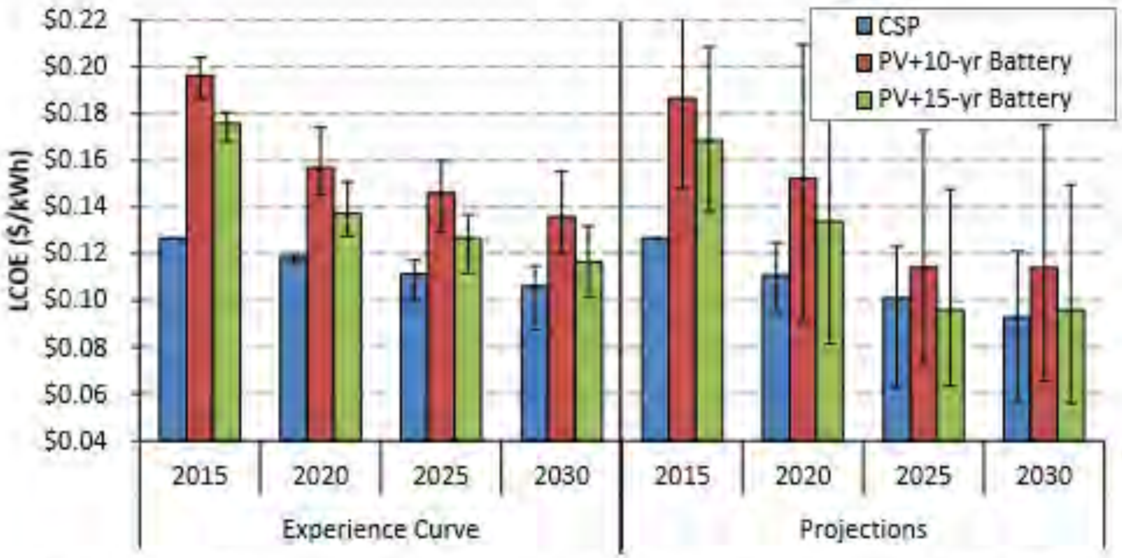

Figure 26. LCOE comparison: CSP versus PV (six hours of storage), 2015–2030

Mid case is shown with uncertainty bars representing the span of the low to high cases.

- Although **battery storage** will continuously increase its **role in electrical vehicles and distributed systems**, STE is the dispatchable RE for large scale power plants, supporting the grid like coal power stations.
- Construction for reliable dispatchable generation fleet for 2030 has to start soon / TODAY

STELAWorld main concerns

THIRD: IRP expectations about the role of conventional technologies

- Promoting new coal or gas combined cycle plants without gas infrastructure on a pure commercial basis - **Can a country afford such unlimited risks?**
- Which financing organization could take the risk of **uncertain carbon taxes, environmental pollution or even operational restrictions** during the payback time of the loans, which might result from future international agreements?
- Who knows how long will it take for a **new nuclear power plant** to be constructed? What will be the **final costs** once finished? Once finished, will it operate during its whole **life span** or **the threat of an unexpected serious accident** even somewhere else that will raise citizen opposition to nuclear?
- Who knows the **real costs for decommissioning** an older nuclear plant respectively for radioactive waste management. Is this a heavy burden we simply want to transfer to next generations?

Instead, a **significant percentage of CSP** in the renewables generation mix will reduce the need for investments in conventional technologies and **lead to a more sustainable and cheaper system than the base case in the IRP proposal**

The rationale to support a large CSP deployment in S.A.

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1. **Technical**
   CSP is the only **dispatchable and grid-friendly renewable technology** with potential enough to firmly **meet the electricity needs in SA** to achieve an almost carbon free generation system.
   A wise mix with other renewables technologies will be the right choice.

2. **Local Economic Development**
   Local content of CSP plants - and conversely its **GDP contribution and job creation** – should be one of the main drivers when planning the new power generation fleet in SA

3. **Affordable cost with higher value**
   The value of CSP plants is right now already competitive to cover the increasing power demand of SA **compared to "investing twice" as** it would be the case regarding other intermittent technologies with a **backup** in nuclear, gas or coal. Furthermore **CSP plants will show important cost reductions** when approaching only 10 GW at world level

Macroeconomic benefits for any country's economy

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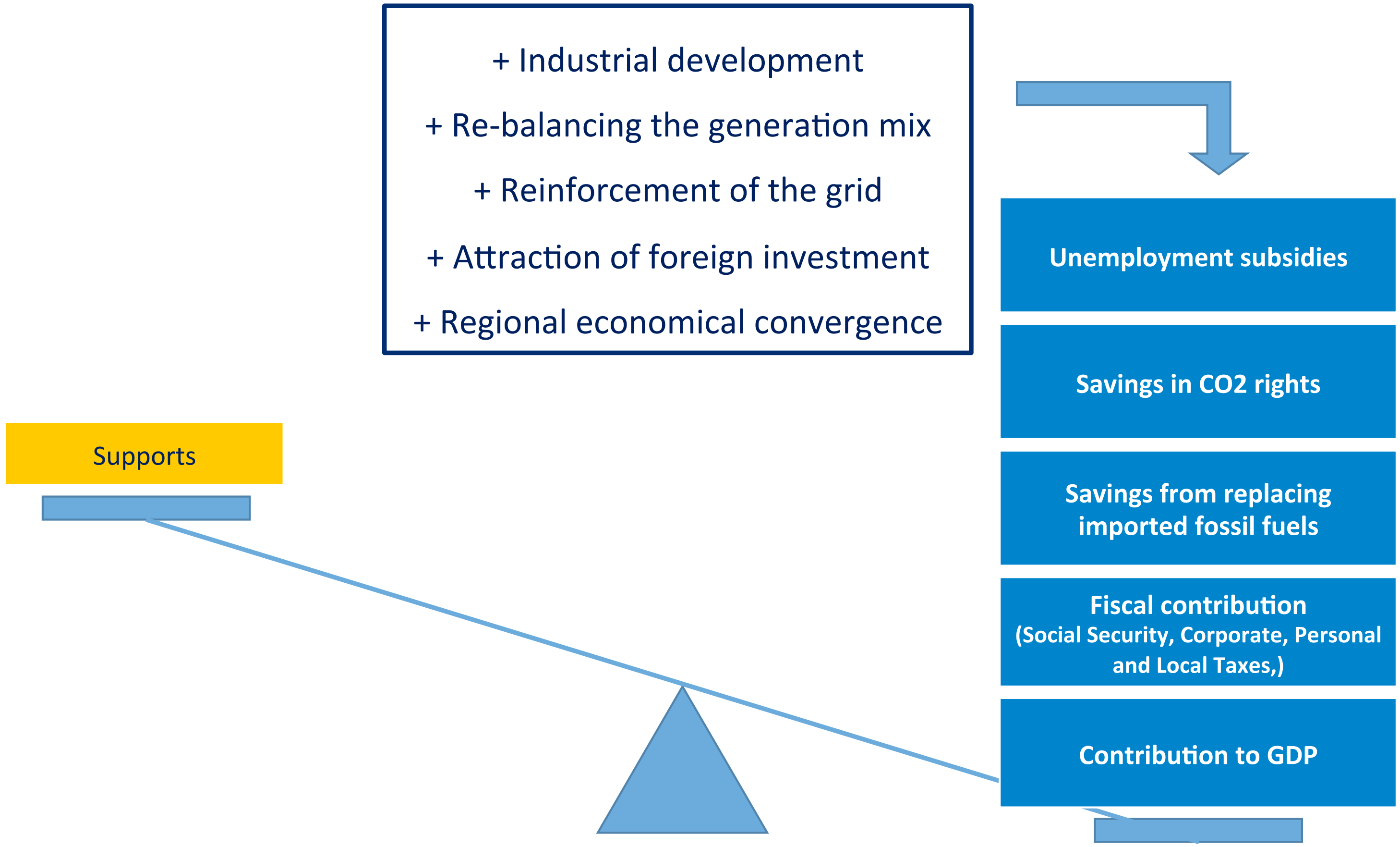
Comparison between premiums and returns of a CSP deployment program



As a conclusion:
Things to remind when talking in 2016 about STE/CSP for South Africa

- ❑ CSP is perceived to be essential in the future generation mix in sunny countries. **South Africa is blessed with an outstanding direct solar radiation** and shouldn't miss this opportunity
- ❑ CSP power plants **can be built in 2 to 3 years time** (and replace capacity when shutting down old coal fired plants). CSP power plants are running flawlessly all over the world

- ✓ **CSP is** - and will continue to be - the **best choice** when planning addition of new capacity in sunny countries.
- ✓ **CSP** should also be the **preferred choice** for policy makers once **all effects** - **technical and economical** - are duly taken into account e.g. **employment and creating CSP industry in SA**

- ❑ Regarding the further development of renewables we should **move away from the current short-sighted *COST* approach to a full *VALUE* approach** for upcoming investments. This will trigger a better balanced share between intermittent and flexible renewables in the power system
– **the only sustainable pathway to a true energy transition "with job creation"**

Finally:
Extension of time request

- The lead time needed for a robust preparation of the consultation process is not sufficient to review the voluminous documentation provided by the Department.
- The quick analysis has been prepared without proper insight into Appendices 7.3, 7.4 and 7.5 which deal with the substantiation of the a) assumed technology learning rates b) the assumed discount rate and c) the report on all other assumptions made in the Draft IRP 2016.
- The CSP technology **costs** used in the base case are **taken from the EPRI 2015 report which no longer reflect** neither **the reality** neither worldwide **nor** for the South African **market** (REIPPP).
- **The value of CSP with thermal storage is not fully understood** and there is a need for CSP to be modelled correctly because of its ability to provide: **baseload, mid-merit and peaking** solar thermal electricity apart from **ancillary services and contribution to grid stability**.
- We **request the DOE to publish the policy adjusted scenarios** now to be presented and commented on as part of the consultation **process to ensure alignment with** the pressing **needs of our country** such as; sustainable **youth job creation** and social justice, **localisation and black industrialisation**, climate change and environmental **sustainability**, sustainable socio-economic development and the 2030 National Development Plan (NDP)