

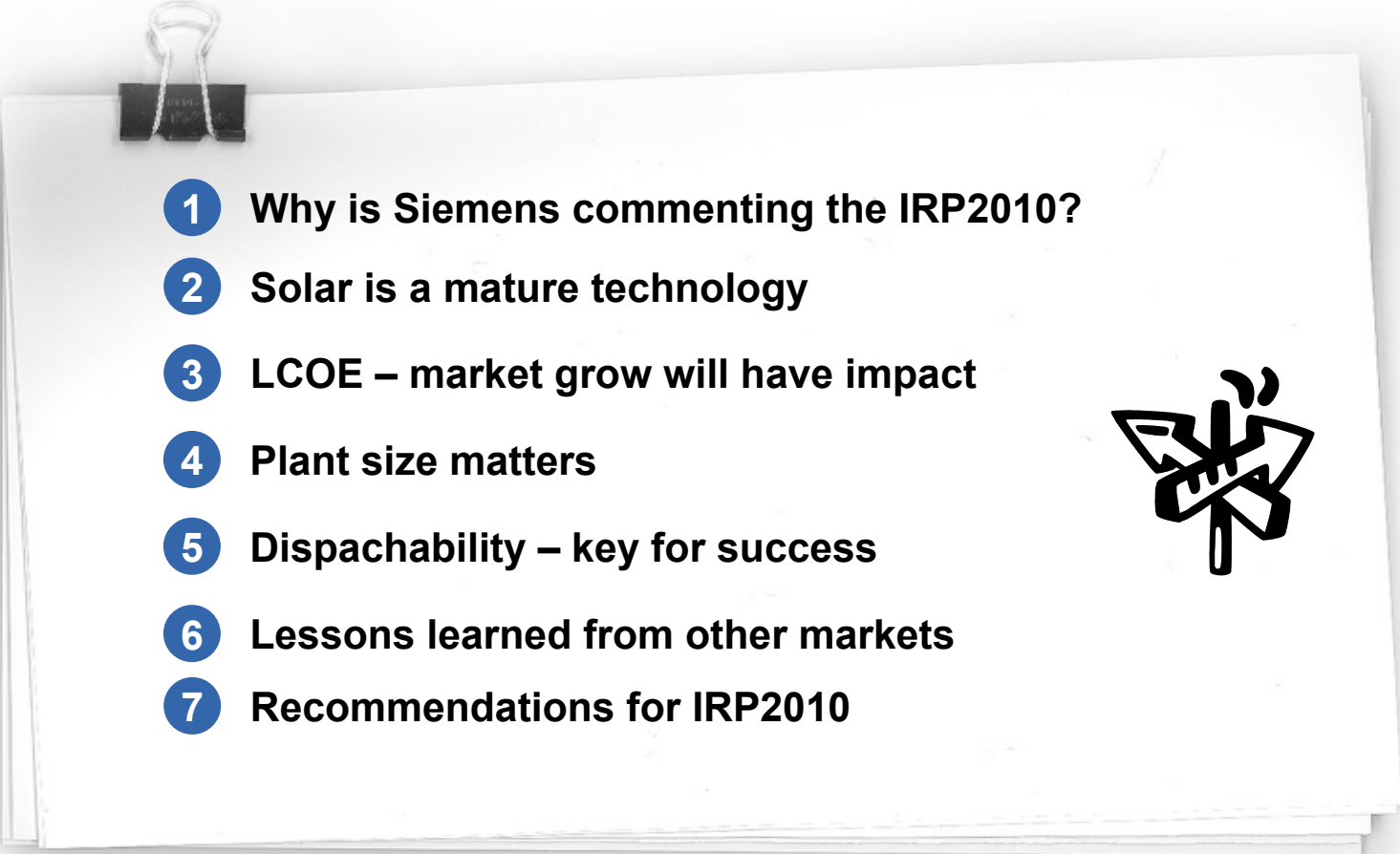
South Africa IRP2010 Comments

Public Hearing in Cape Town
November 29, 2010

E R STE



Overview

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Why is Siemens commenting the IRP2010?

Siemens comes from a neutral position, being active in all Fossil and Renewable Energy generation fields and technologies. Siemens has experience from our own investment in Solar (CSP & PV) technology based on own research, as well as our experience of existing Solar projects, its viability and best practice approach.

We believe that the IRP2010 underestimates the potential, and the viability of Solar Energy for South Africa.

In the following few slides we wish to create more awareness amongst the IRP stakeholders, that

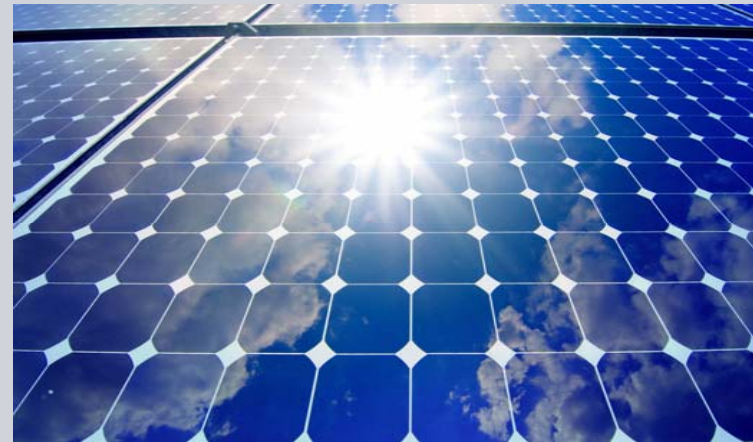
- **Solar energy is viable** and is has a short term potential as significant energy source for South Africa,
- That **larger scale investments** of 100MW and above must be considered for best RoI & LCOE,
- That the Concentrated Solar Trough technology is a **low risk, and mature technology** to consider,
- That effective **storage options are available**,
- That photovoltaic power generation is a mature, proven and reliable technology, and
- That **significant localisation and job creation** can be achieved in the solar industry if the market stimulus is large enough.



Solar power generation is a mature technology

Why PV?

- Uses diffuse irradiation as well as and DNI, hence is also well applicable in places with high cloud effect at acceptable performance
- Low complexity at plant structure
- Small plant sizes and rooftop residential configuration possible
- High modular character
- Large field experience for Si-wafer-based & thin-film PV
- Promising technology outlook with CPV



Why CSP trough technology?

- **More than 20 years successful commercial field experience**
- Commercial utility size plants state of the art
- Most mature and bankable technology with ~500 MW in commercial operation and >1 GW under construction
- Retrofit activities on first operational plants on solar components already successfully finalised
- Combination with process steam and ISCC possible (hybrid)

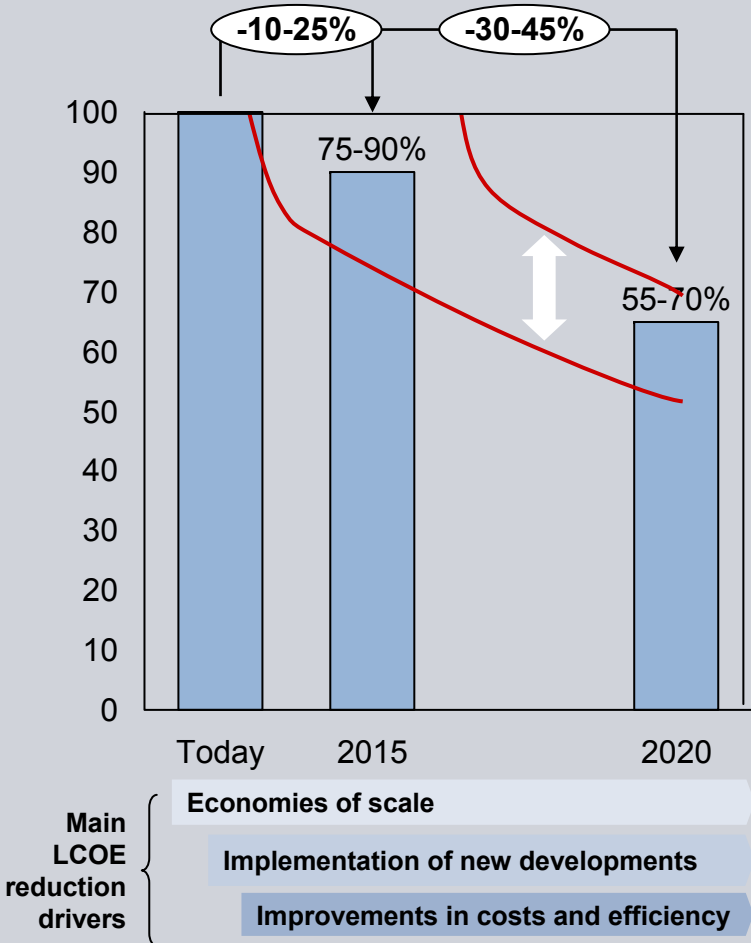


All applications have their respective strengths – there is no such thing as a silver bullet!

LCOE – Conservative outlook

Market grow will have considerable impact

LCOE development outlook until 2020¹, e.g. CSP
(in % compared to today's level)



- Effects vary across the technologies and plant dispatchability
- Effects of varying radiation due to different locations is not considered

↑↓ = uncertainty corridor, depends also on market development

1) = Source: Siemens STE market observations and independent studies

Plant size matters, example CSP

For PV:

Minimum PV plant size
3MWp
Plant size increase up
to 50MWp possible

Economics of scale

- Large effect on CAPEX through increasing of the plant capacity size
- Decrease coming mainly from:
 - shared services during development and implementation
 - manufacturing efficiency ramp-up
 - Equipment efficiency increases with size

Large size CSP plant
e.g. 175MW_{el}

Small Size CSP Plant

e.g. 50MW_{el}



Maximum plant size driven by experience:
Commercial plant sizes up to 70MW_{el} in the
market



Dispatchability – key for success

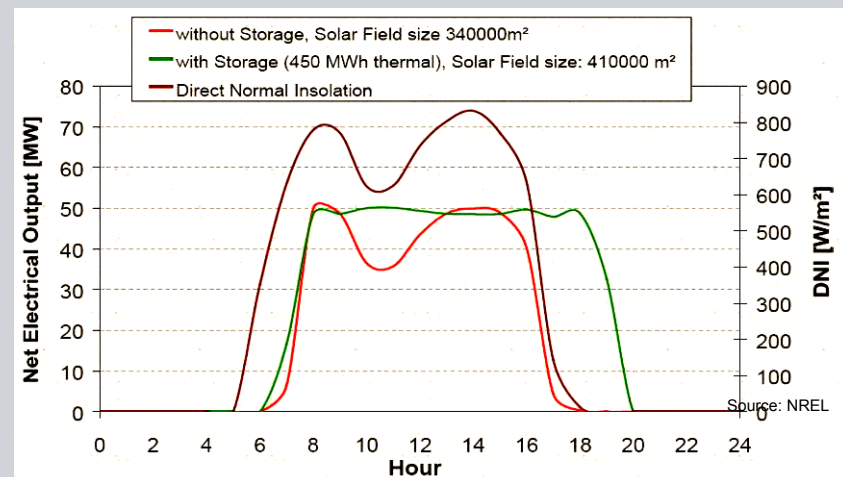
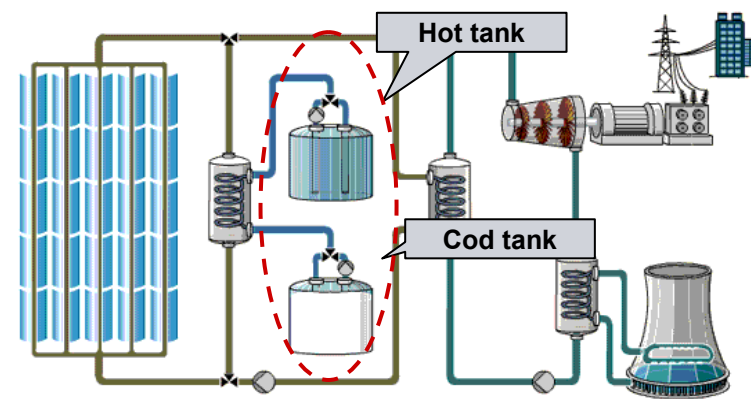
- Thermal Energy Storage (TES) allows solar power dispatch after sunset and achieve high capacity factors for a CSP plant
- TES in any form promotes flexibility and stability in grid operations (e.g. buffering during transient weather conditions)
- Adding TES requires additional solar field capacity. This cost is offset by generating more energy

- Molten salt storage (with cold and hot tank) is currently most mature TES technology with several reference plants in operation



- Other Storage technologies are concrete and phase changing material (PCM), though at a very embryonic stadium
- R&D is currently ongoing in the market to make TES more broadly applicable
- Innovative combinations of CSP and PV can exploit the TES-technology even further

Molten Salt storage



Overview of other CSP markets

Spanish Market



CSP-Projects

2.300 MW allocated through
Royal Decree 661/2001

Incentive Outline:

- Type: feed in tariff
- Cap: 49,99 MW_{el}
- Application: deadline given
- Implementation: staggered deadlines
- Adjudication: License (*first-come-first-serve*)

Market Considerations:

- Solar program caused a considerable rallye for available licenses
- Totally inexperienced players emerged
- Reopening of tariff conditions causes considerable insecurity for the projects and hinders financing
- effective cap of the plant size hinders the technology development

US – Market



Incentive Outline:

- Type: tax credits, grant, loan guaranties
- Cap: no cap
- *Application*: different in each scheme, e.g. deadline for groundbreaking: 14.09.2011 for loan guarantees
- Implementation: no deadlines
- Adjudication: general application (*first-come-first-serve*)

Market Considerations:

- No direct impact on average national electrical tariff, as feeding of incentives comes from tax funds
- Incentive used to cover the bridge between CSP LCOE and average national energy tariff
- Most projects making advantage on accessible public land
- Licensing on public land resulted to be very onerous and time consuming jeopardising projects

Recommendations for IRP2010

We recommend that:

- The IRP includes increased CSP and PV capacity planning in its forecast,
- and the underlying weightings and assumptions for Solar installations in the model be reviewed
- with an approach in which the economics of >100MW solar installations be considered.
- and the use of Thermal Energy Storage be encouraged.

We propose that:

the local Solar industry be placed on a fast development path, by supporting conditions in which

- initial solar project developers, local manufacturers and construction will get going with early investments, and
- an economy of scale which is significant enough to enable investment with the aim of becoming a global solar generation lead country.

We suggest that:

formal localisation potential studies be commissioned, to assess in more detail the potential for job creation in this industry,

And above all that South Africa do not miss this chance to position as globally competitive, and leading provider of Solar generation and its value chain.

