IRP 2010 Public Hearings
December 2nd, 2010
Johannesburg

THE World Leader in Concentrated Photovoltaic (CPV)

Amonix, Inc.

- **Established.** Founded in 1989, Amonix technology represents more than half of the world CPV installations
- **Proven.** Over 15 years of real-world experience in utility and intensive energy users environments
- **Innovative.** Integrated solar systems based on the world's highest efficiency multi-junction cells initially created for satellite and space applications
- **Best choice** for decentralized clean energy production in sunny and dry climates
  - Low cost of energy
  - Requiring no water in power production
  - Using land more efficiently, producing more energy/acre than any other solar technology
  - Proven reliability and predictability
  - Very flexible in deployment size and timelines

APS
Southern Nevada Water Authority
AEP TEXAS A unit of American Electric Power
NVEnergy
PG&E Corporation
GUASCOR FOTON

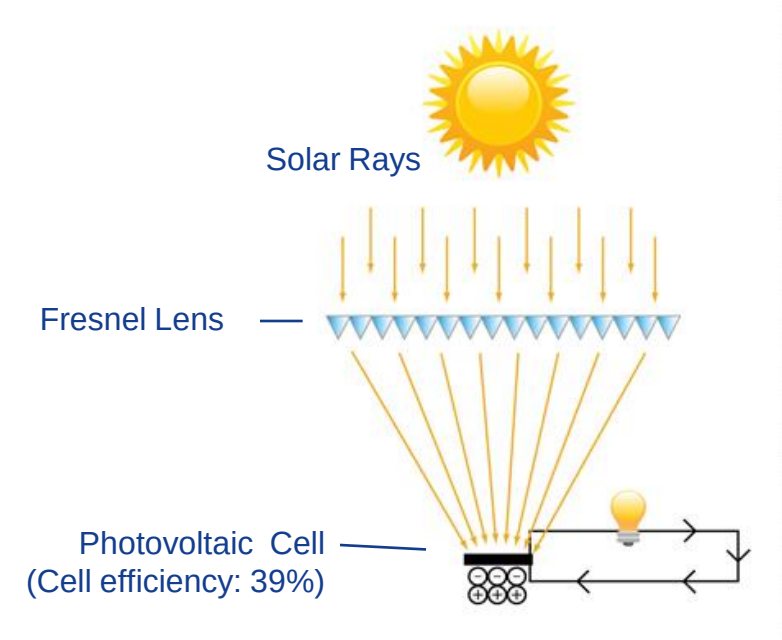
AMONIX POWERING THE FUTURE NOW

What is CPV?

Concentrated Photovoltaics (CPV)

Concentrating sunlight with optics…

Getting the most of sunlight and scale effects…



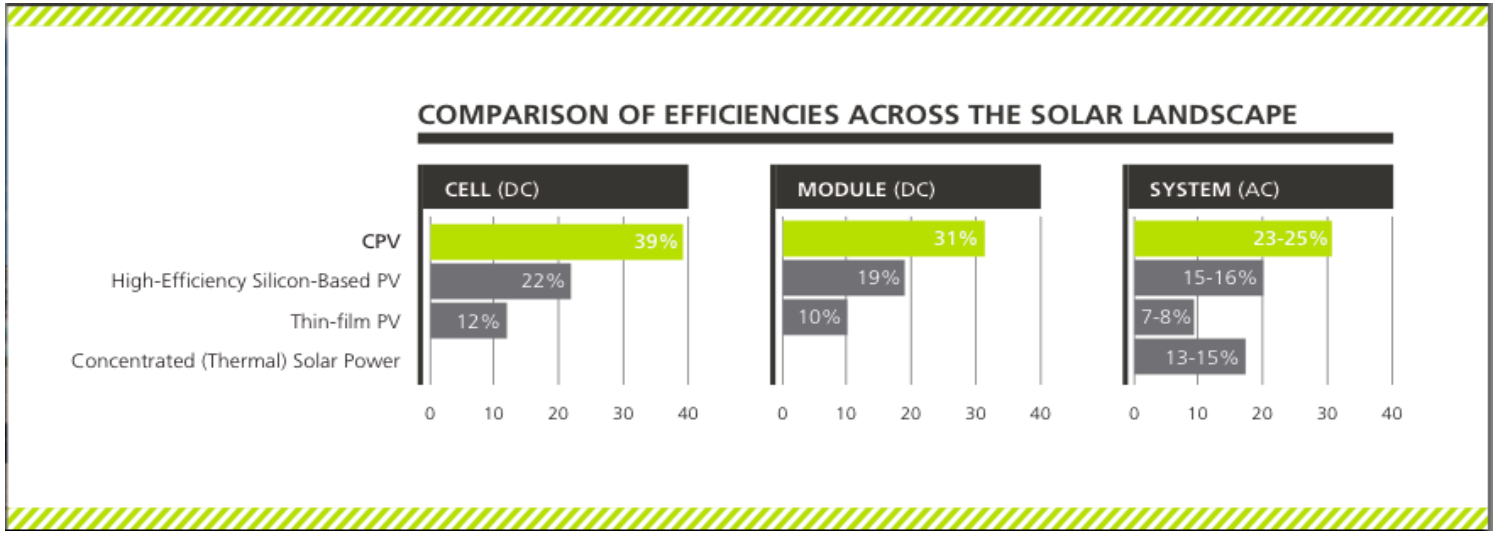
...on the world's most efficient photovoltaic cells

…by fully tracking the sun with large 2 axis systems

AMONIX
POWERING THE FUTURE NOW

CPV vs Other Solar Technologies

Efficiency and Cost

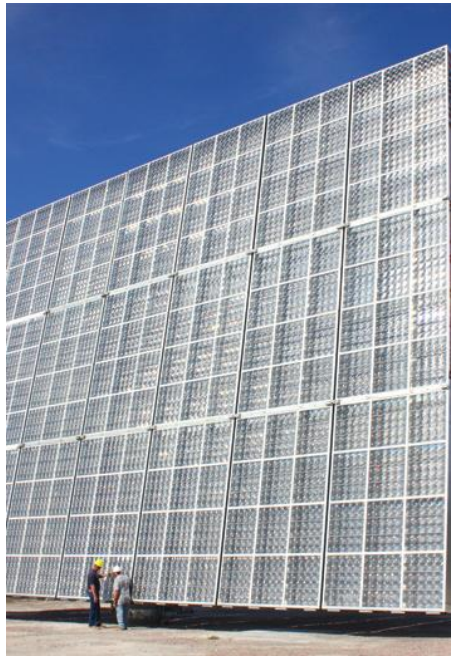


	CPV	PV
LCOE **10 MW plant in S.A.** ***(source: EPRI report)***	2300 ZAR/MWh	>2400 ZAR/MWh

CPV is most efficient, has a lower LCOE, and is upgradable at small cost after rated lifetime

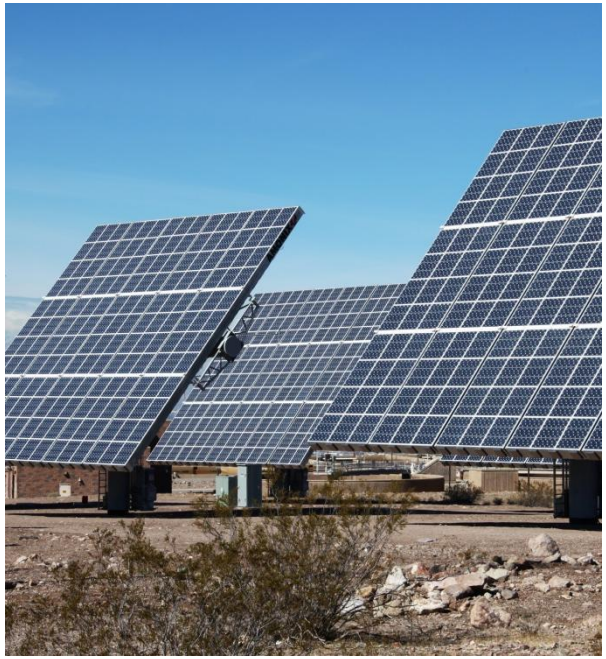
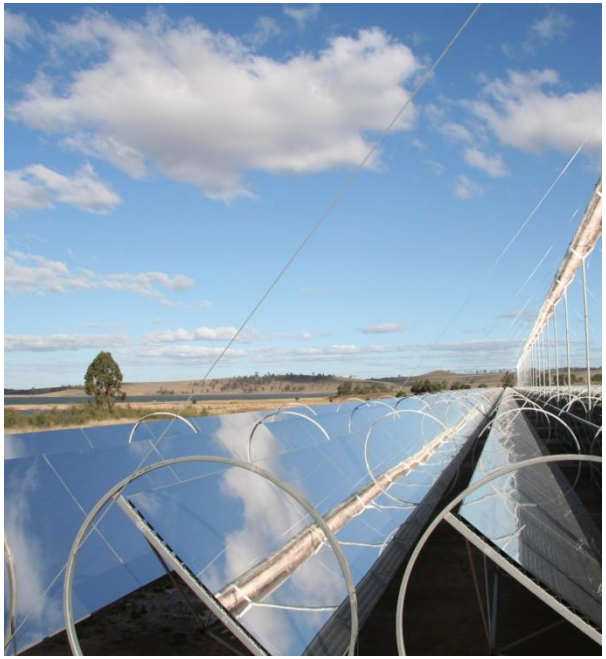
CPV vs Other Solar Technologies

Flexibility in deployment SIZE and TIMING

Thin Film PV	Silicon PV	CPV	CSP
			
10kW and up 1 year	10kW and up 1 year	60kW and up 1 year	50MW and up 4 years

CPV vs Other Solar Technologies

Use of Water

CPV / PV	CSP Air-Cooled	CSP Water-Cooled
		
No water used in power production	500MW air-cooled CSP tower ~ 150 000 m^3 / year	500MW water-cooled CSP plant ~ 4 000 000 m^3 / year

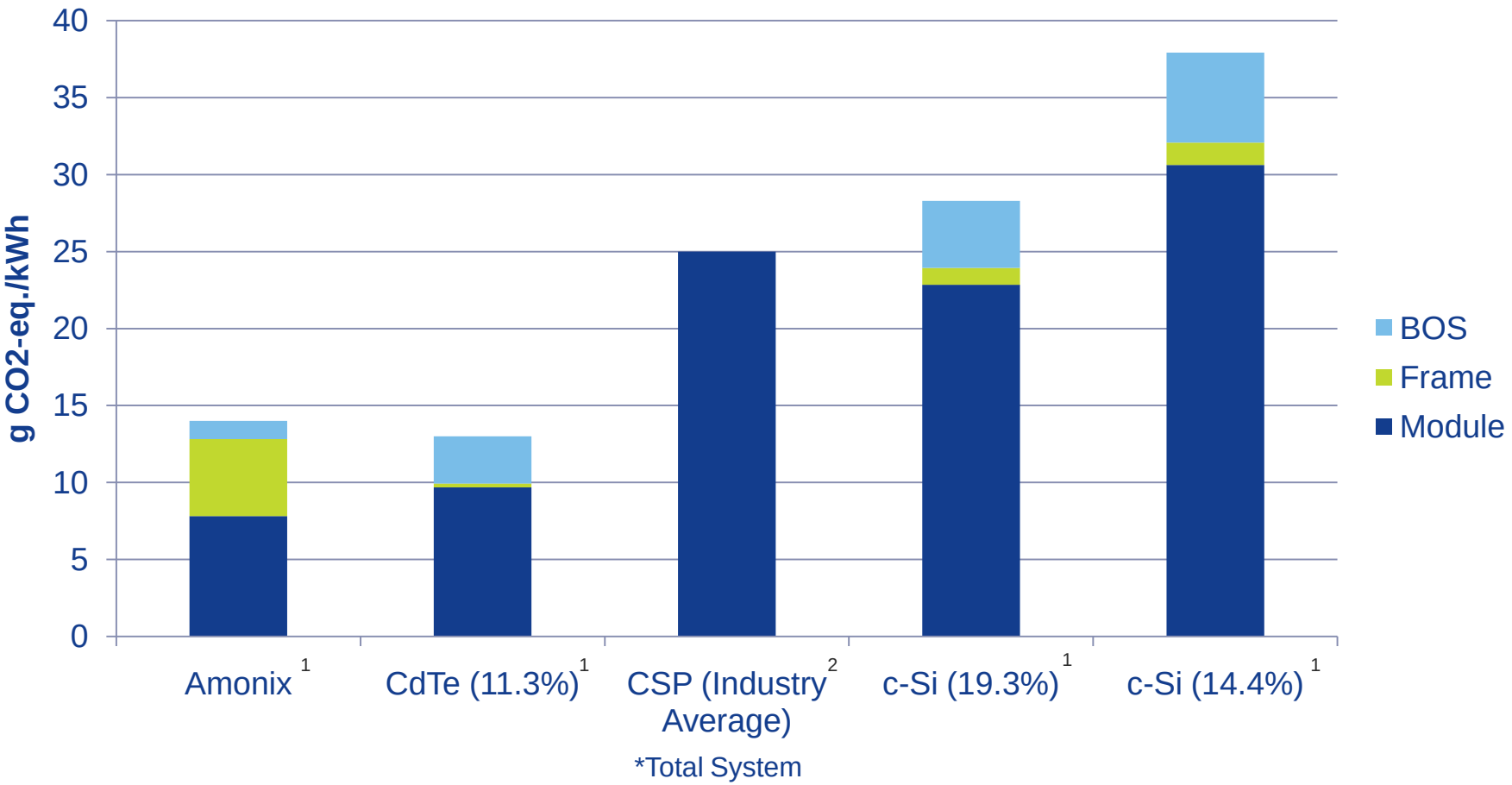
CPV vs Other Solar Technologies

Use of Land

Dual Land Use	More Energy Per Acre
	
Minimal Environmental Disruption	4.5 Acres / MW

CPV vs Other Solar Technologies

Carbon Emissions



[1,2] Source: **Life Cycle Assessment of Amonix 7700 HCPV Systems, V.M. Fthenakis and H.C. Kim,** Center for Life Cycle Analysis. **Variability in Life Cycle Greenhouse Gas Emissions from Electricity Generation Technologies,** Garvin Heath, NREL.

CPV is Commercially Proven

7.8 MW plant in 2007

Parques Solares de Navarra (Spain) - Amonix CPV Technology

Amonix HCPV Technology Licensed by Partner, Guascor Foton

The Revised Balanced Scenario

Outline of Amonix Comments

- Need for **strong short-term action** on supply capacity
- Need for a **clear-cut** solar energy policy
- Need for more **balance between wind and solar**
- Need to grasp the "**Solar Economy**" opportunity
- Need to reduce **carbon emissions**

Need for strong short term action on supply capacity

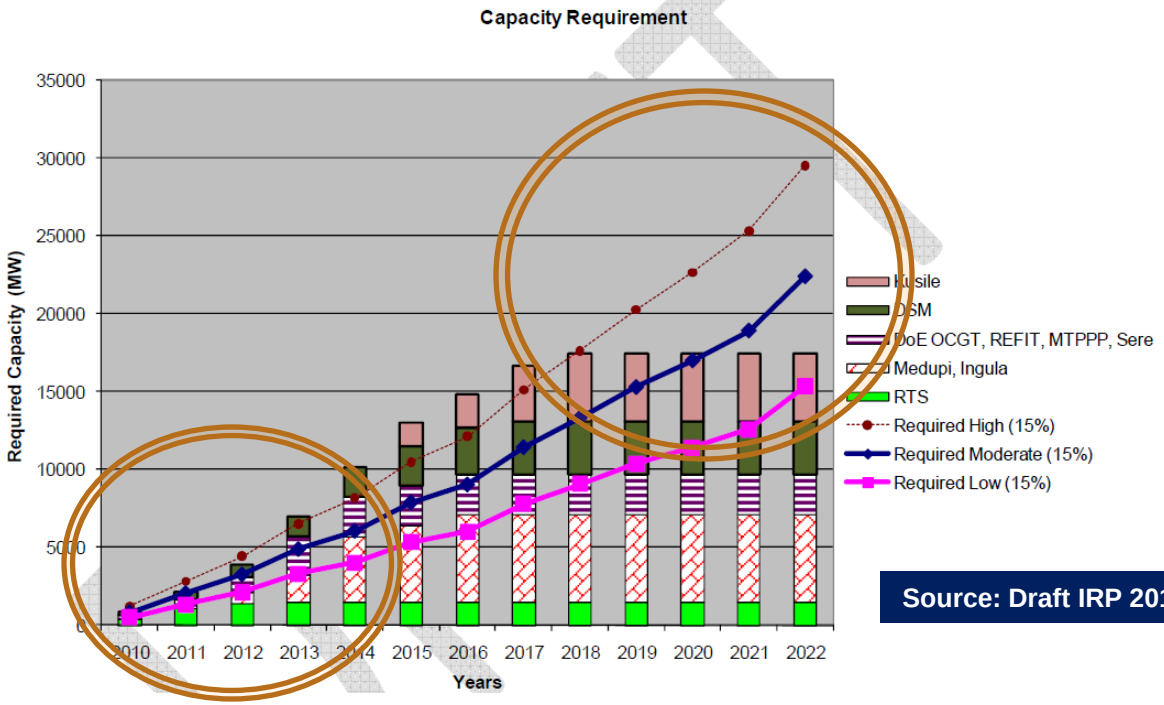
- The current situation poses “a serious threat to government’s objectives for growth and job creation” (*MTRMP*).
- “severe risk of power shortages caused mainly by the threat to maintain the current Eskom Generation fleet performance [...] and extended delays in the commissioning of Medupi and Kusile Power Stations” (*draft IRP*)
- “this requires extraordinary action, in the main by government, Eskom, business and large metropolitan councils.” (*MTRMP*).

Note: MTRMP refers to medium term risk mitigation plan

Need for strong short term action on supply capacity

CPV allows for quick deployment to mitigate short term supply constraints

Figure 1. System capacity requirement



Source: Draft IRP 2010

- The draft IRP reflects high risk in generation shortfalls from 2011 to 2013 and starting 2017.

Need for strong short term action on supply capacity

Economic slow down can be mitigated by deploying CPV

- Determining future generation capacity using a cost minimizing approach will not lead to achieving long term economic growth targets.
- It is very difficult to estimate the actual cost of unsupplied energy.
  One needs to take into account more than the cost of electricity shortfalls.
- Power supply is a main driver of a country's economy. Abundant cheap power from 1970 to 2000 has driven the SA economy.
- Short electricity capacity will significantly slow down the economy.
- Abundant electricity supply while more expensive initially, will foster economic growth in the long term. However abundant more expensive electricity might not benefit the poor, but neither will scarce electricity

Need for a clear-cut solar energy policy

- Current lack of clarity in:
  - The overall solar energy policy
  - The policy for each distinct solar technology
- The draft IRP 2010 does not **mention the Northern Cape Solar Park**.
- The draft IRP 2010 does not **clearly differentiate the different solar technologies**. CPV, PV and CSP have different:
  - Flexibility in deployment size and timeline
  - Cost and efficiency
  - Water and land use
  - Impact on the country grid
- REFIT II is not clear whether CPV technology can utilise the PV tariff.
- **The final IRP must be explicit regarding solar energy policy, prevent any of the above confusions between solar technologies.**

Need for more balance between wind and solar

PV / CPV solar technology has been proven and is complementary to wind

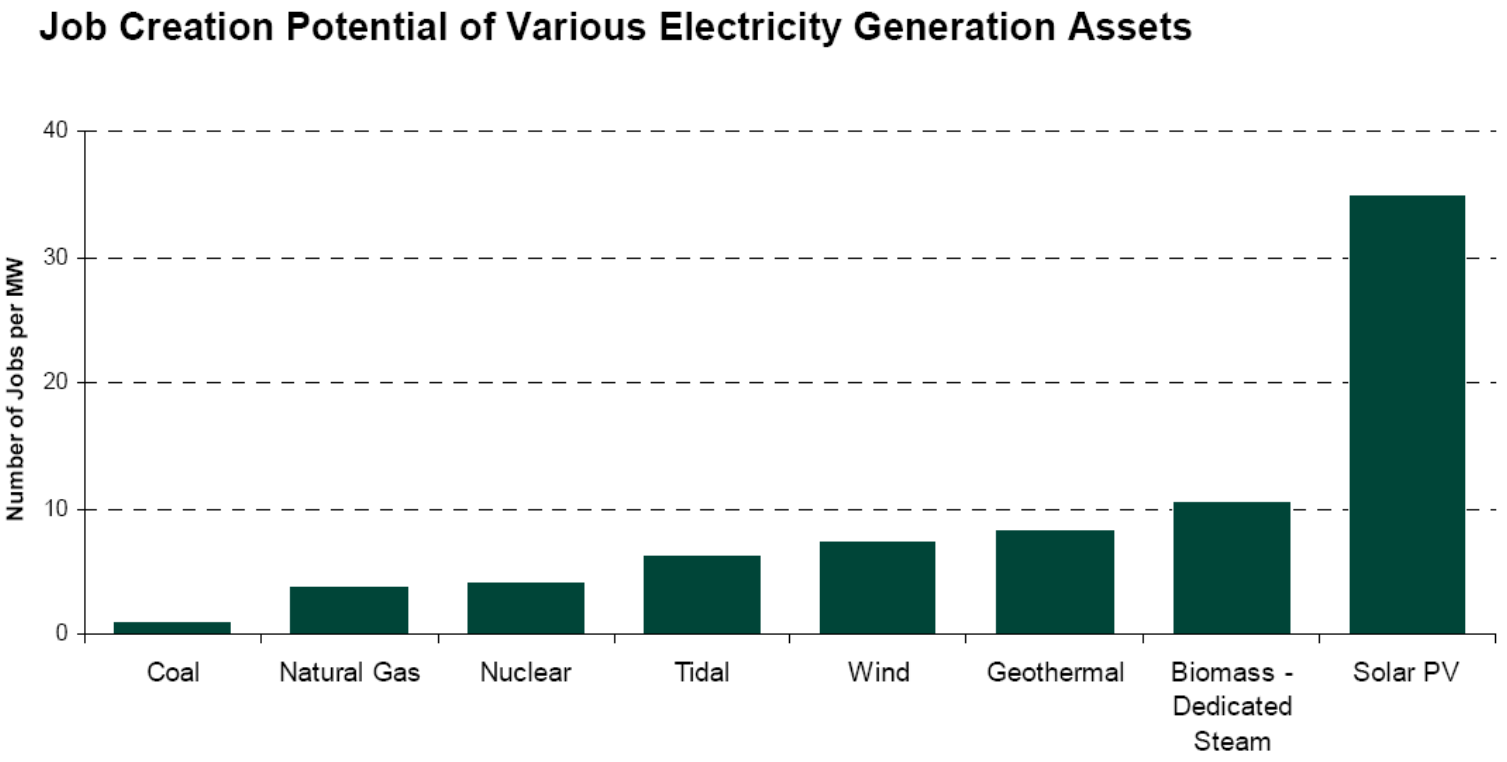
- The Draft IRP adds 4.5GW wind compared to 600MW solar by 2020, **BUT**:
- Wind and solar (no storage) are complementary sources of energy:
  - When it is not sunny, it is windy and vice versa.
  - Solar peaks at noon, Wind peaks at night.
  - Adding up wind and solar generation in scattered geographic locations reduces the individual volatility of these two energy sources (NREL et al. studies).
- Balancing wind with solar considerably reduces transmission grid costs by providing a power solution much closer to baseload generation.
- **When developing a long term resource plan, solar PV/CPV and wind must be considered as a combination rather than separately.**

Need to grasp the “Solar Economy” opportunity

- South Africa has among the best locations for solar energy. Higher DNI than Southern Europe, US deserts, the Middle-East.
- The current need for large amounts of new generation is a unique opportunity to develop a “Solar Economy” in South Africa.
- It will result in tens of thousands of direct jobs in a high-tech innovative promising industry, reaching out to remote locations. Hundreds of thousands of indirect jobs .
- With “only” 600MW of solar generation in 2020, South Africa will lag behind, and will have lost a significant opportunity.
- The cost of solar will steadily decrease dramatically, wind will not.

Need to grasp the “Solar Economy” opportunity

Amongst power generation solutions, solar PV / CPV is most attractive for job creation



Source: INEEL, BC Sustainable Energy Association, Renewable Energy Policy Project, Lehman Brothers research

Conclusion

- Allocating capacity to Solar CPV will strongly help reach the IRP objectives:
  - Short term Urgent Generation Needs
  - Carbon Emissions Reduction
  - Regional Development
  - Job Creation
  - Security of Supply
  - Low Cost
  - Low Water Usage