



AE-AMD Renewable Energy Limited



PV Market development in RSA

-

Comments to IRP-2010

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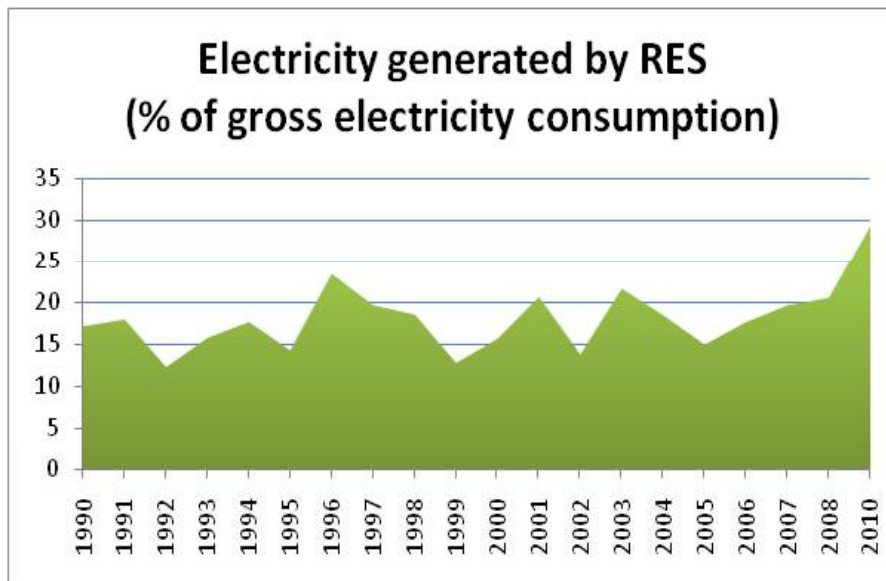
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Spanish PV market – Overview

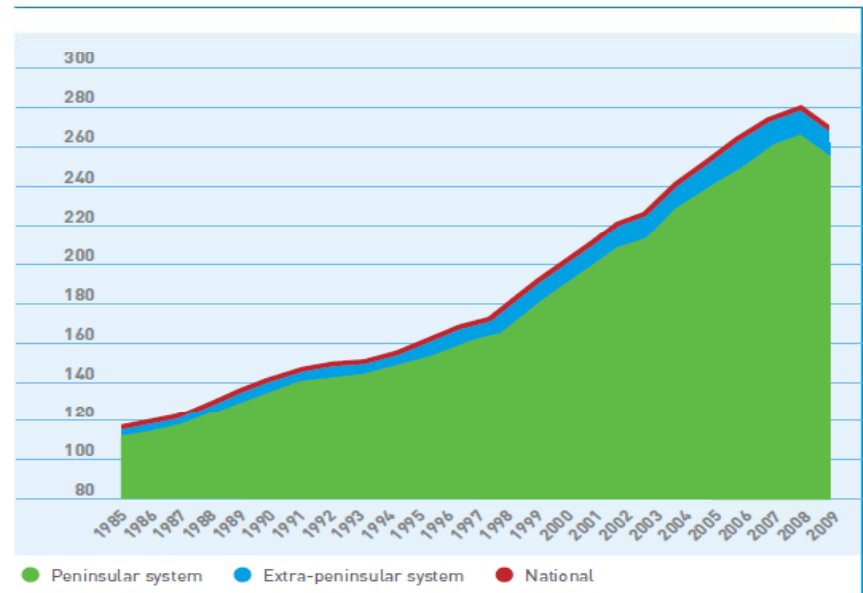
Spain's support for renewable energy technologies began in 1980 with the approval of the first law on renewable energy, the "Law of Energy Conservation". Since then a variety of instruments, mainly legislative measures and financial support have been used in introducing renewable energy. The current tariff system was introduced in 1997 through the Electric Power Act.

Under this system, Spain has developed significant capacity in renewable energy power plants. The technology categories under their scope of application for Feed-in Tariffs include solar, wind, hydro and biomass.



Source: EUROSTAT

Evolution of electrical energy demand (TWh)



Courtesy of REE



Spanish PV market – Overview



Main targets of 2001/77 EU Directive (1.Jan.2012 -> Derogated by 2009/28/EC)

- Increase share of “green electricity” from 14% to 22% by 2010 in EU
- Increase share of RES in total consumption from 6% to 12% by 2010 in EU
- Compliance with commitments based on 1997 Kyoto Protocol

Main targets of 2009/28/EC Directive

- Increase share of RES in total consumption from 12% to 20% by 2020 in EU

Main targets of PER 2005-2010

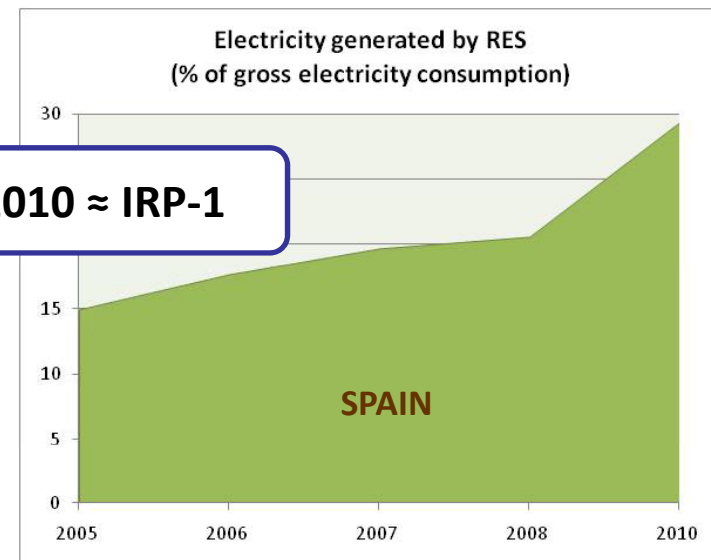
- Primary energy consumption by RES in 2010: 12.1%
- Increase share of electricity generation by RES to 30.3%
- Avoidance of CO2 emitted in 2010 of 24,500,000 tCO2equiv.

Benefits in EU of increasing the share of PV energy during period 2001-2010:

- Investments of 10 billion €
- Avoided fuel costs of 0.2 billion €
- Avoided external costs of 0.2-0.5 billion €
- Avoided emission of 2.2 million tons of CO2
- Creation of 30,000 direct new jobs

Source: European Renewable Energy Council (EREC)

PER 2005-2010 ≈ IRP-1

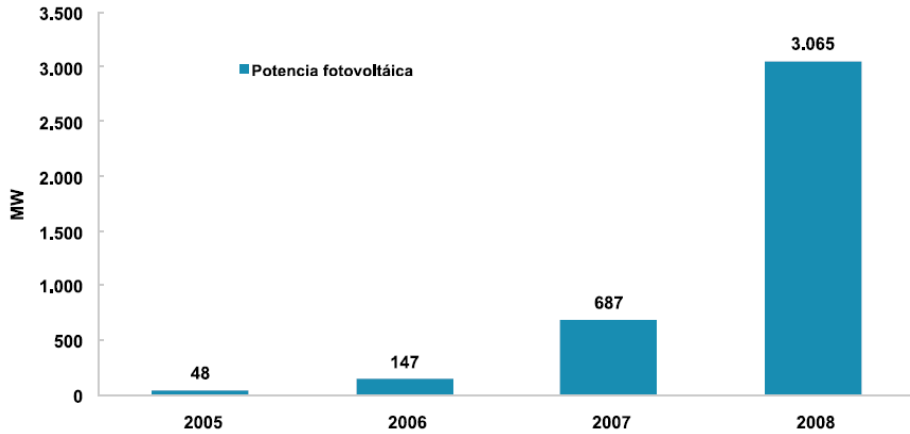


Source: APPA

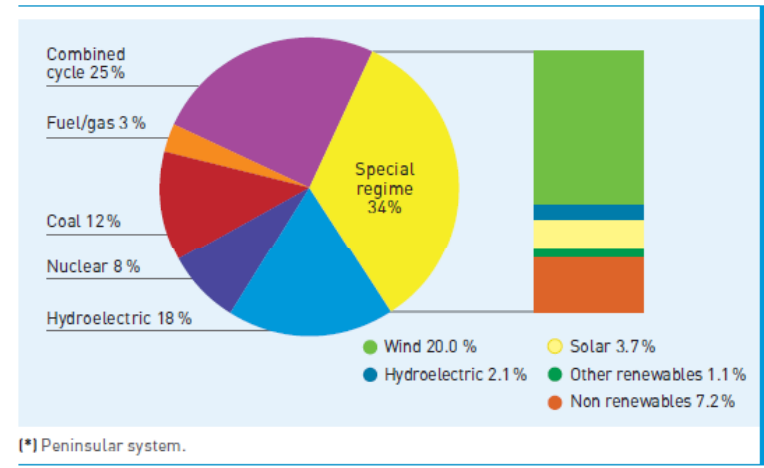
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Spanish PV market – Overview



■ Installed capacity as on 31.12.2009 (*)



(*) Peninsular system.

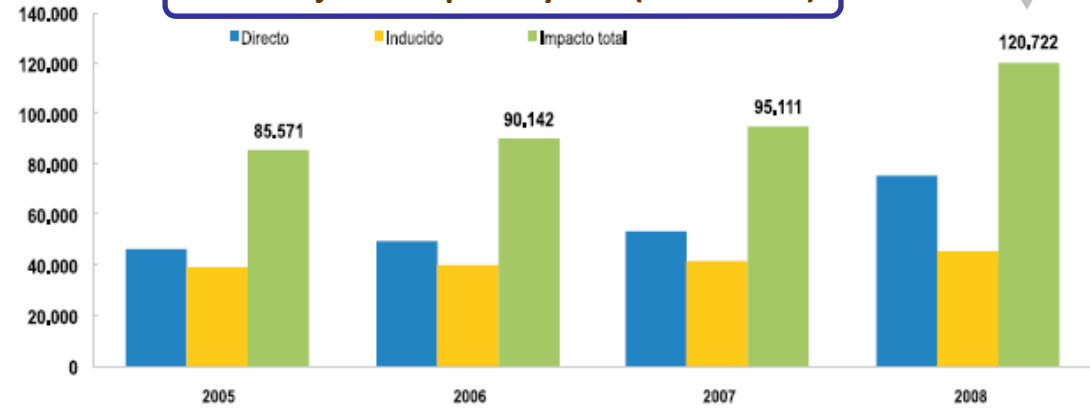
Courtesy of REE

Type of generations:

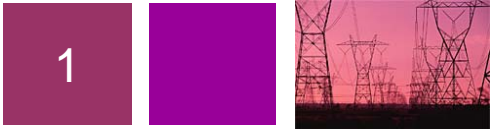
- Ordinary Regime:
 - Coal
 - Fuel/Gas
 - Combined Cycle
 - Nuclear
- Special Regime
 - Wind
 - Photovoltaic
 - Hydroelectric
 - Co-generation
 - Other RE

Main increase produced in 2008 was because of PV power growth

Created jobs in Spain by RES (2005-2008)



Source: APPA 5



Spanish PV market – Overview

The developing of PV market has promoted the establishment of a new industry of engineering companies and manufacturers related to:

- PV Modules
- Inverters
- Trackers
- Electrical engineering companies
- EPC companies

	Estimations		
	2010	2015	2020
PV Industry Direct jobs	19,552	33,617	47,527
PV Industry Indirect jobs	8,798	48,745	21,387
Total PV Industry	28,350	82,362	68,914
Share of RES	24.49%	38.81%	34.11%
Total RES Industry	115,722	212,189	202,015

Source: IDEA Dec'10

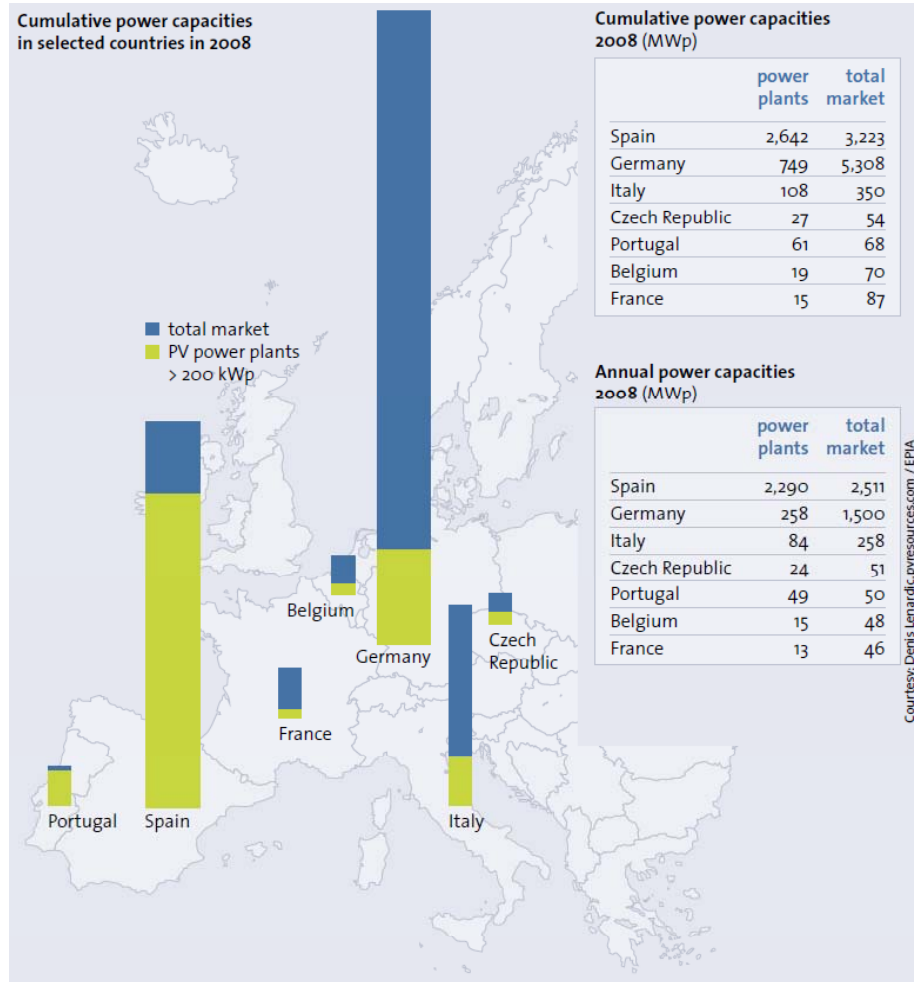
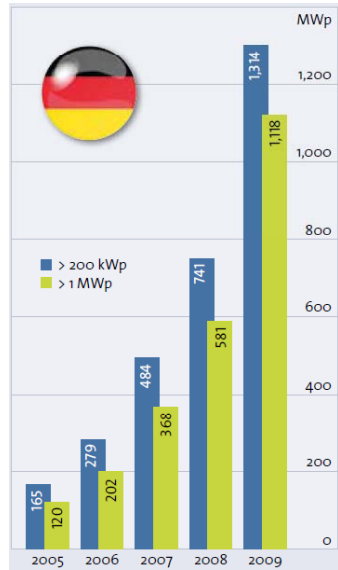
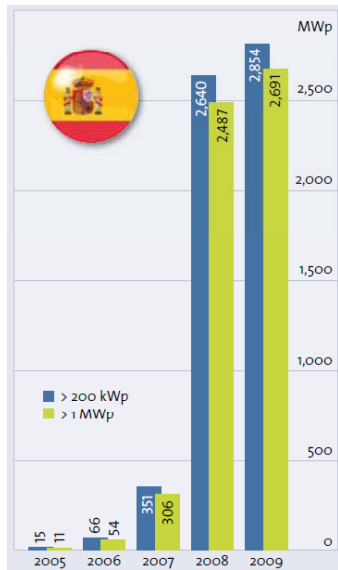
	Direct total jobs	%
Equipment manufacturing	26,387	37.6%
Construction & Installation	11,840	16.9%
Project development & services	12,834	18.3%
Distribution & selling	7,228	10.3%
R & D	3,185	4.5%
O & M	8,395	12.0%
Training	283	0.4%
TOTAL	70,152	100%

Source: IDEA Dec'10



EU PV market – Overview

Spanish & German PV Markets (installed cumulative capacity MWp):



Source: PVResources Auth. Denis Lenardic
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Benefits of PV development in Spanish economy

ENVIRONMENTAL BENEFITS

- ✓ Clean & not polluting energy
- ✓ Unlimited resource
- ✓ Free-cost resource
- ✓ Minimal environment impact
- ✓ Other land uses can be performed
- ✓ Produces no radioactive waste
- ✓ Avoids CO2 emissions
- ✓ Simple technology
- ✓ Reduces the Global Warming

ECONOMICAL BENEFITS

- ✓ Stimulates the national economy
- ✓ Promotes the local economy development
- ✓ Creates new job opportunities
- ✓ Avoids electricity price fluctuation
- ✓ Contributes to network integration
- ✓ Network expansion compatibility
- ✓ Reduces the fossil fuel dependence of the country
- ✓ Consolidate a high-standarized sector
- ✓ Export know-how to other countries

SOCIAL BENEFITS

- ✓ Promotes the sustainable development of the region
- ✓ Uses local resources
- ✓ Good social aspect
- ✓ Safe technology
- ✓ Produces no dangerous waste
- ✓ Stable technology toward future crisis
- ✓ Ideal for remote installations electricity supply

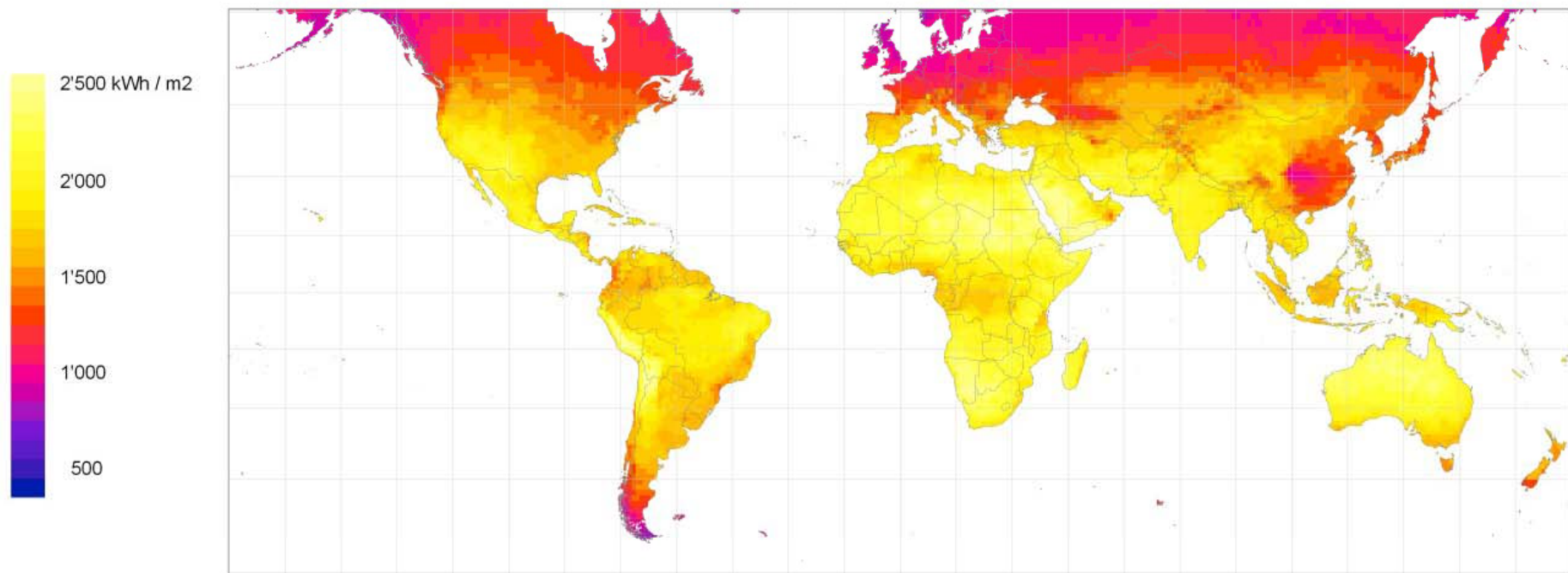




Southafrican PV market – A promising future

What about South Africa? Does South Africa will take advantage of its resources?

Yearly sum of global irradiance



Source: Meteonorm

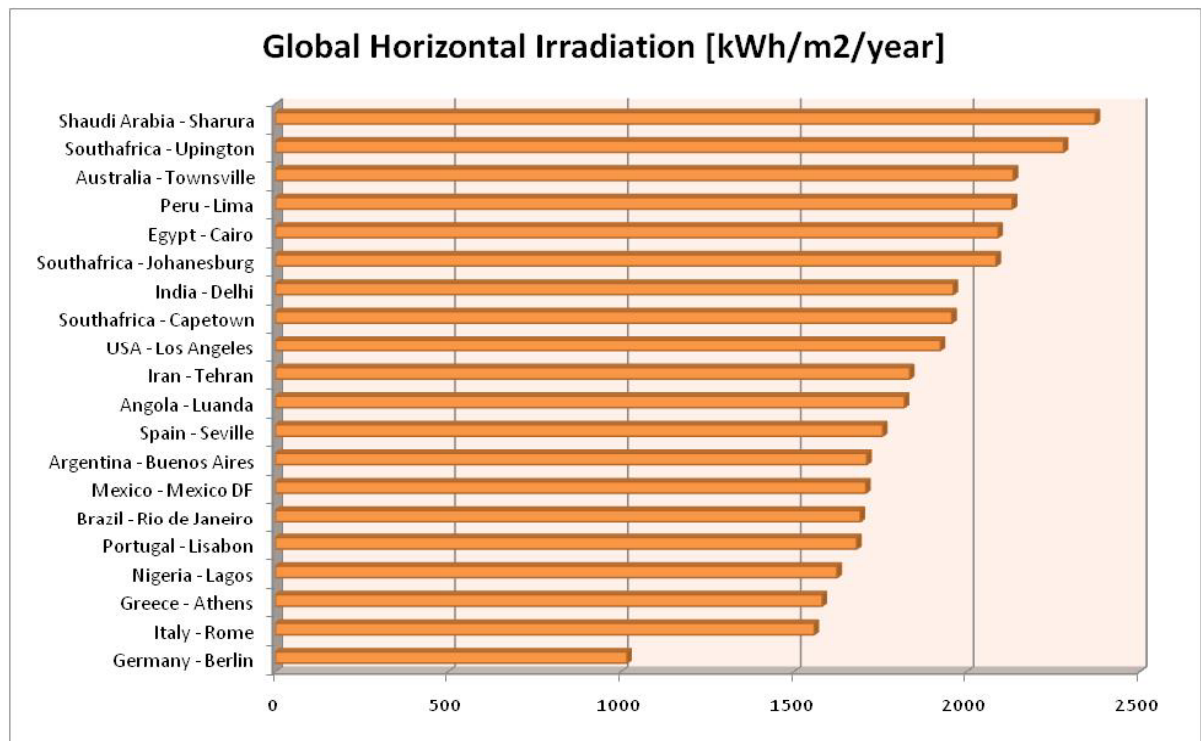
Republic of South Africa has one of the highest irradiation level in the world...

... let's use it!



Southafrican PV market – A promising future

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Source: Meeonorm

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Southafrican PV market – A promising future



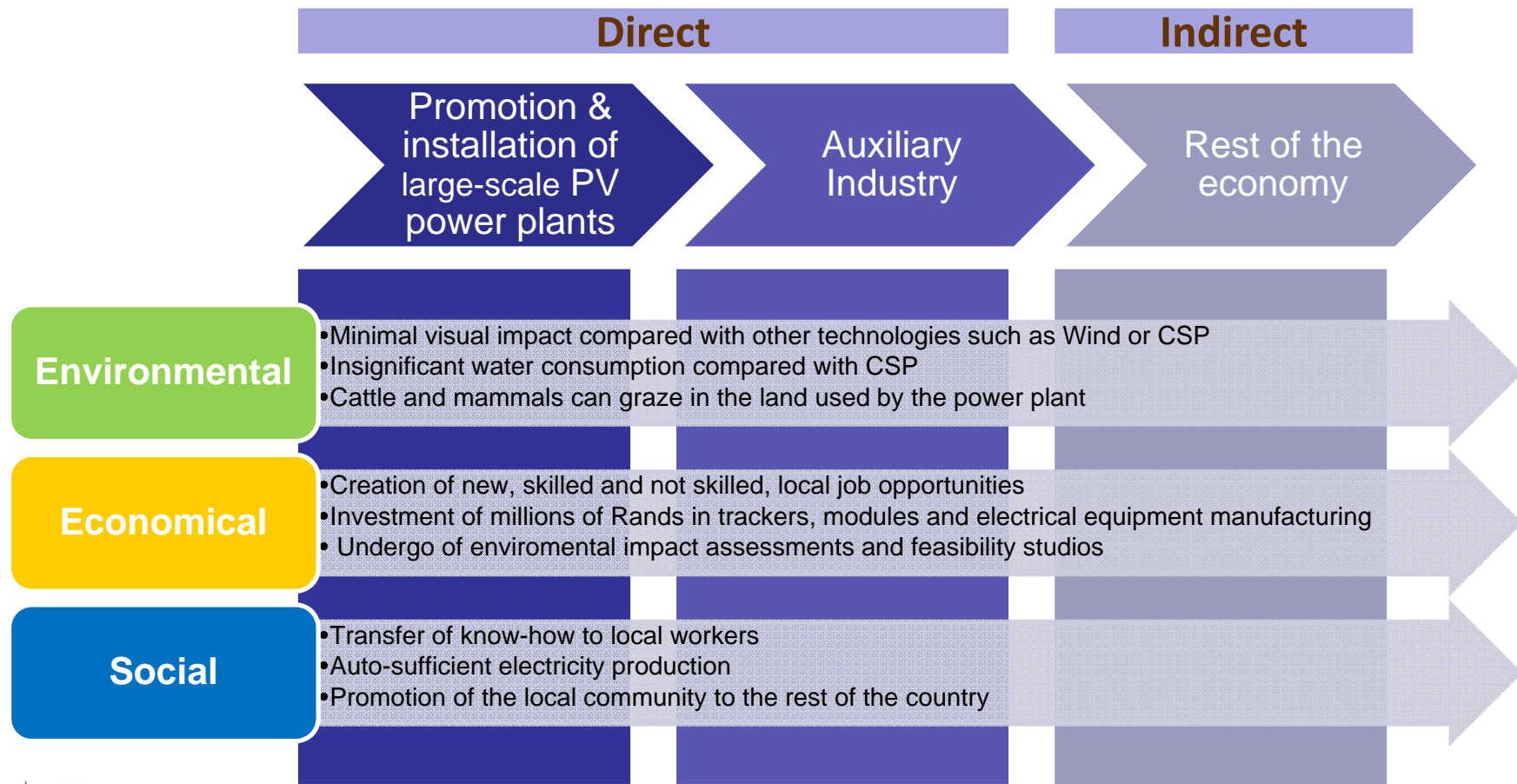
Approx. Costs	1500 €/kW installed	6500 €/kW installed	4000 €/kW installed (tracked)
Full production equivalent hours	2200 – 3500 kWh/kW	2500 - 3600 kWh/kW (with storage)	2500 – 3000 kWh/kWp
Land – Power	220 Ha – 40 MW	200 Ha – 50 MW	25 Ha – 5 MW (Tracked) 7.5 Ha – 5 MW (Fixed)
Water consumption	None	800,000 m ³ /year	Minimal
Distance to subst.	Far away	New subst. required	Close
Improvement of electrical network	Not needed	Needed	Not needed
Construction period	9 months - 1 year	1.5 – 2 years	7 months
Other uses of the land	Cattle & Buildings	No	Cattle

PV Technology can be as affordable as Wind or CSP



Southafrican PV market – A promising future

Summary of benefits for RSA from installing large-scale PV power plants:



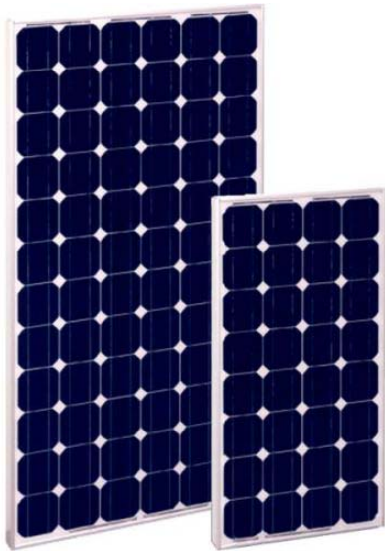


Comments to technical data report produced by Electric Power Research Institute:

- Crystalline silicone PV modules have not been considered
- Crystalline silicone PV modules have highest contrasted cell efficiency (15%)

- Thin film technology is a new and not-contrasted technology
- Thin film technology is cheaper but needs larger surfaces & structures
- Thin film output power is not as precise as in crystalline modules

- Concentrated PV technology is currently under development
- Concentrated PV technology requires extremely accurate suntracking ($< 0.1^\circ$)
- Concentrated PV technology requires cooling systems due to high temperatures
- Concentrated PV elements suffer optical degradation





Comments regarding to advantages of solar PV development in South Africa

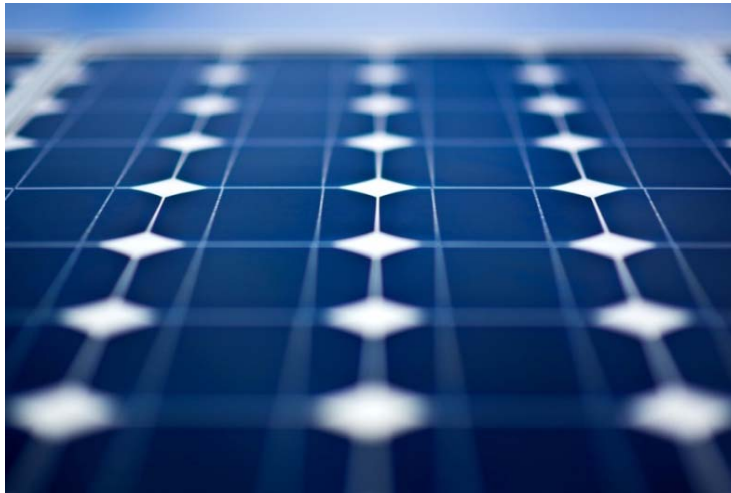
- SA has three manufacturers of crystalline silicone PV modules
- Other technologies require foreign equipments
- New South African PV industry will be able to export its mature technology to other vicinity countries

- Wind and CSP plants will require to export power to the grid, putting pressure on the network operator to distribute the produced power
- Wind and CSP plants may require to build new electrical facilities
- PV power plants are feasible from as small as 5 MW
- PV power plants can be established adjacent to an existing substation
- PV power plants are ideal for remote locations where there is no planned grid upgrade

- PV power plants do not require as much skilled staff as CSP and will contribute to local employment
- PV power plants require the shortest delivery time and can be commissioned within next year
- DoE Act (No. 1243 – 31.Dec.09) created a reasonable expectation on PV when REFIT power distribution was announced



Including PV in REFIT phase 1 on the basis of approximately 125 MW not only will generate “green” electricity for South Africans meeting their short-term necessities but also will contribute to create new jobs and to consolidate a new industry with an extremely high potential of development in a long-term future.



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