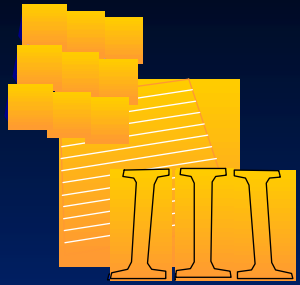


# China: threat or opportunity?

Professor Stuart Wenham  
Director, Photovoltaics Centre of Excellence,  
CTO, Suntech Power



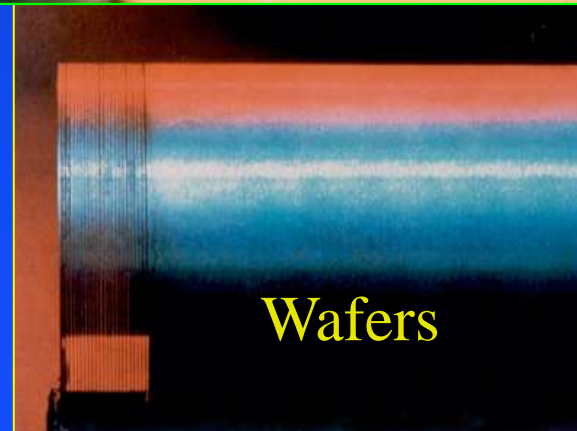
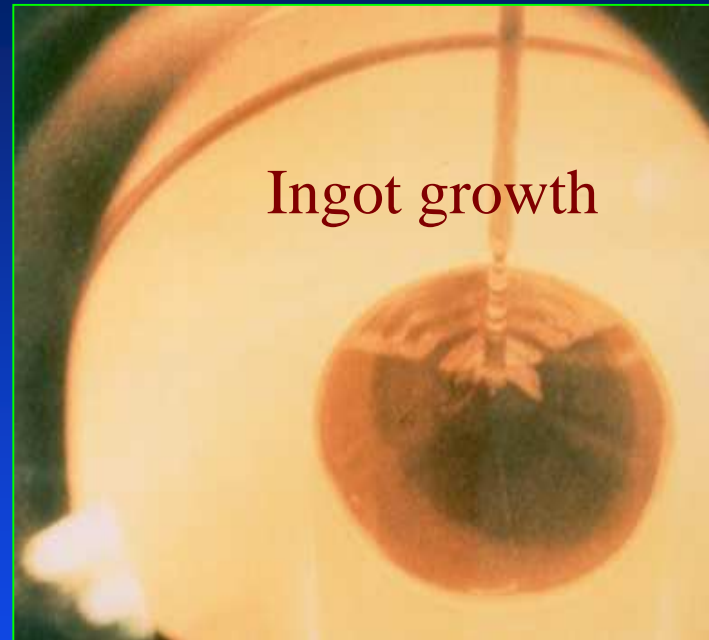


# Silicon Cells – Magic Devices?

Silicon - Abundant & cheap

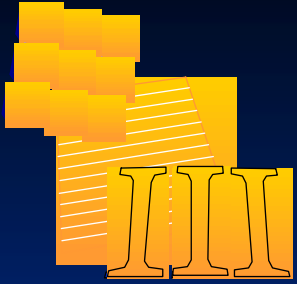


High purity needed



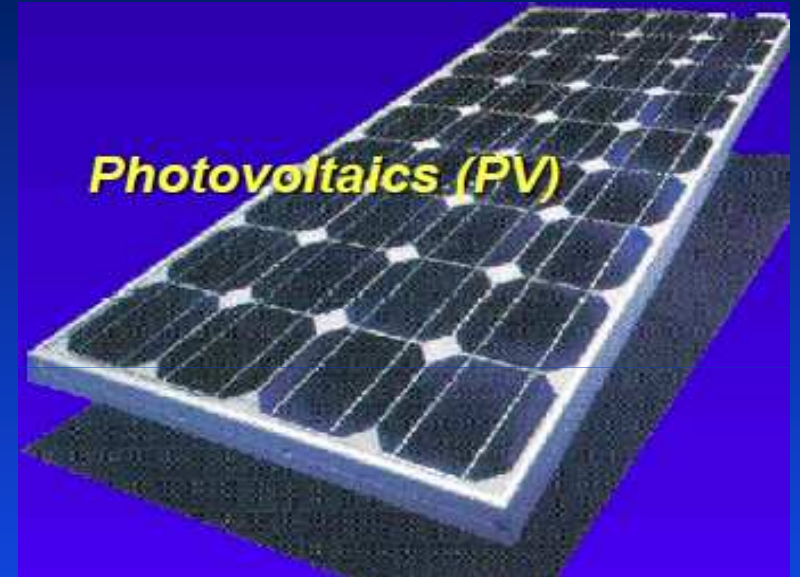
Electricity fi

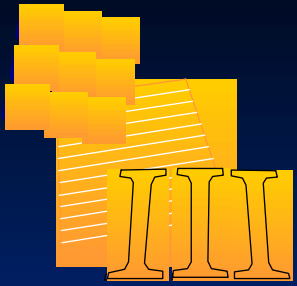




# Photovoltaics – Magic Devices

- While operating, there are:
  - No “wear-out” mechanisms
  - No noise
  - No waste products or pollution
  - No moving parts
  - No operating or maintenance costs
- Life expectancy >30 years
- Environmentally friendly electricity generation
- Modular and can be sized for any load
- The problem has always been cost – this has changed drastically
- PV module prices have fallen 70-80% in the last 4 years

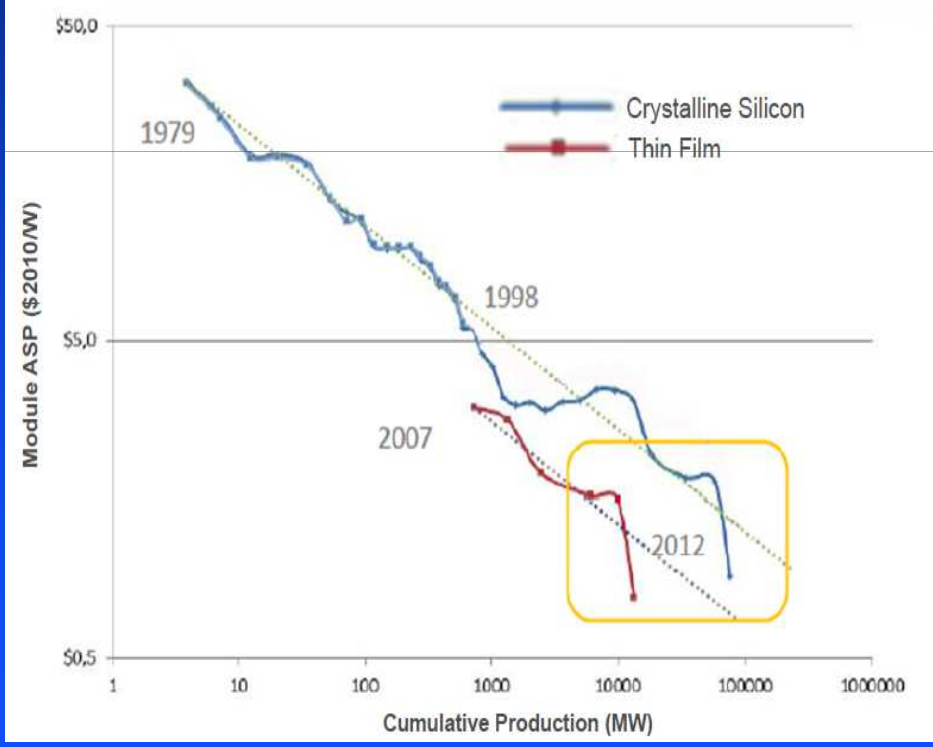




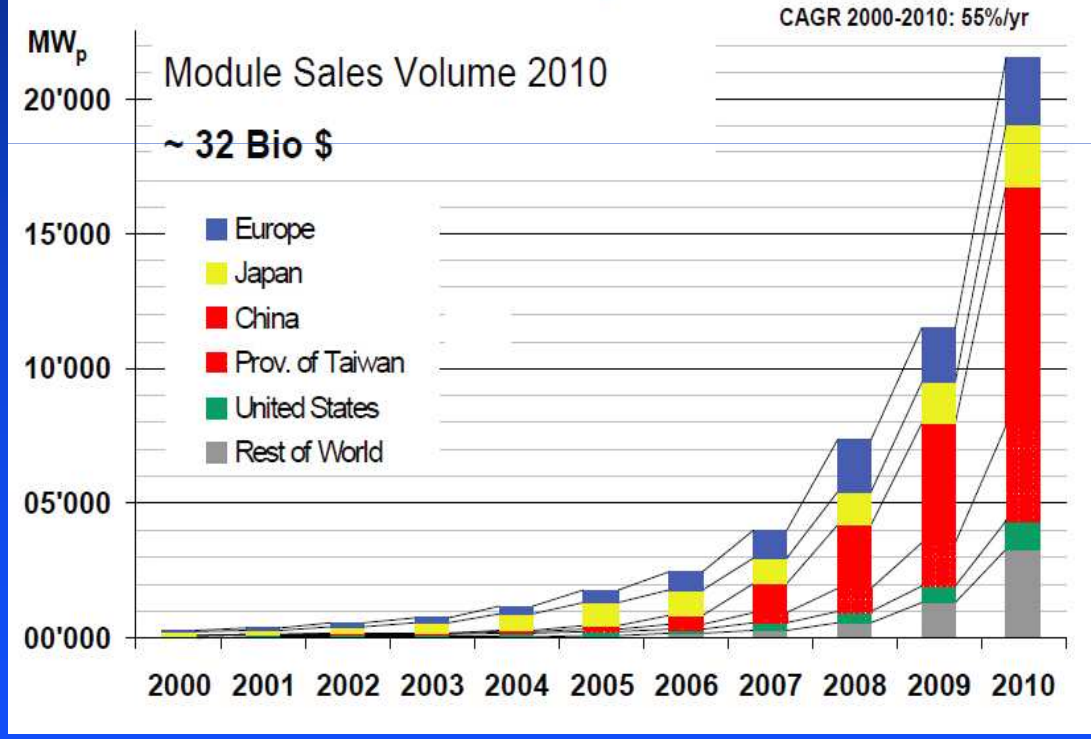
# Fastest Growing Industry World-wide

- Price driven growth
- China dominates PV manufacturing

Recent Times: Accelerated Learning, New Synergies



Annual PV Factory Production



## Germany installs record 4,300 MW photovoltaic solar energy in first half

August 2, 2012

[Other renewables](#)



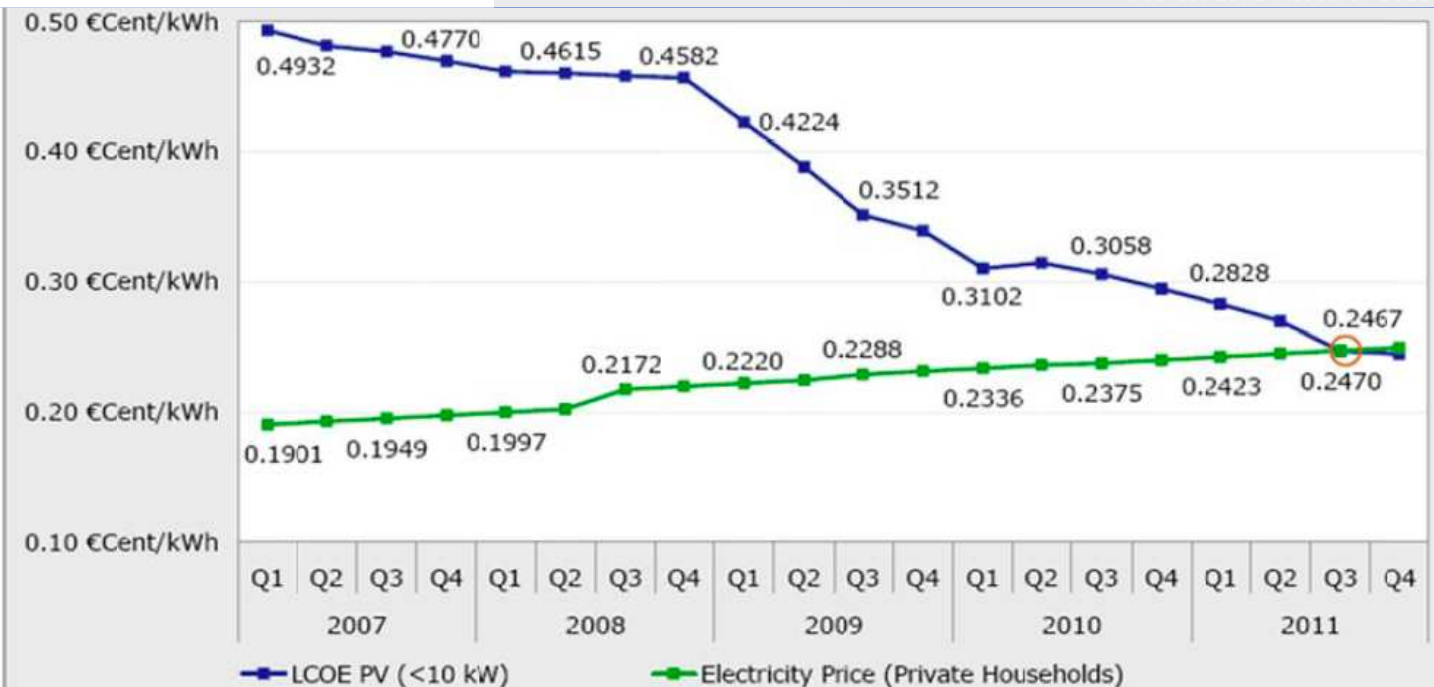
Germany installed a record of around 4,300 megawatts of solar power capacity in the first half of 2012, raising the total in the world's largest photovoltaic market to more than 28,000 MW, the federal network agency (Bundesnetzagentur) reported on Thursday.

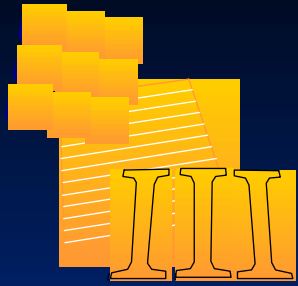
Nearly half of that amount, or about 1,800 MW, came in June in a building frenzy just before a 30 to 40 percent cut in government-mandated incentives took effect in July.

## Price Evolution in Germany – problem with unstable demand

- Large oversupply of modules
- Company GMs 10% - too low
- 20% GM avoids bankruptcies

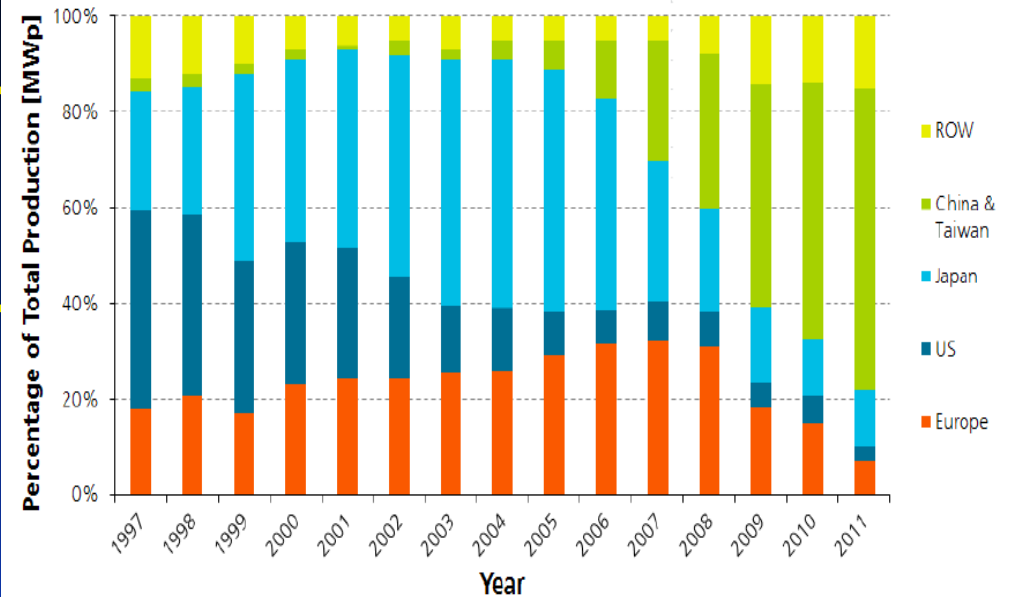
Source: EuPD Research 2011





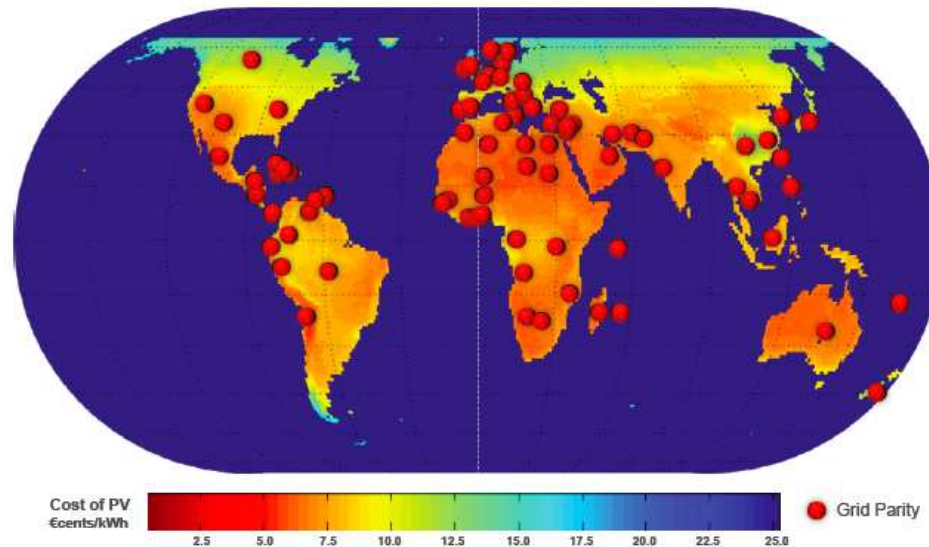
# China: threat or opportunity?

- China threatens PV module manufacturing
- But grid-parity in many markets thanks to Chinese
- PV modules dominated PV system cost until falling 70-80% in last 4 years
- Module costs now 20-30% of system cost (USA)
- 80% of jobs downstream (not in module production)
- China more innovative & efficient commercialising

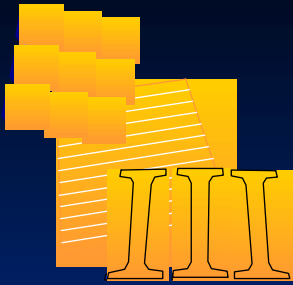


Data: Navigant Consulting Graph: PSE AG 2012

## 2012 Status: PV Solar at Grid Parity



Now  
**2012**  
**102**  
countries have reached grid parity



# US DOE Secretary Stephen Chu concluded: *“China’s leadership not due to low cost labour but superior technology”*

- Reduced energy in production
- Increased cell efficiencies

**BUSINESS**  
**Chinese Solar Companies Thrive on Manufacturing Innovations**

*Suntech Power's CTO argues that the secret to China's success is not cheap labor but advanced equipment for making solar cells.*

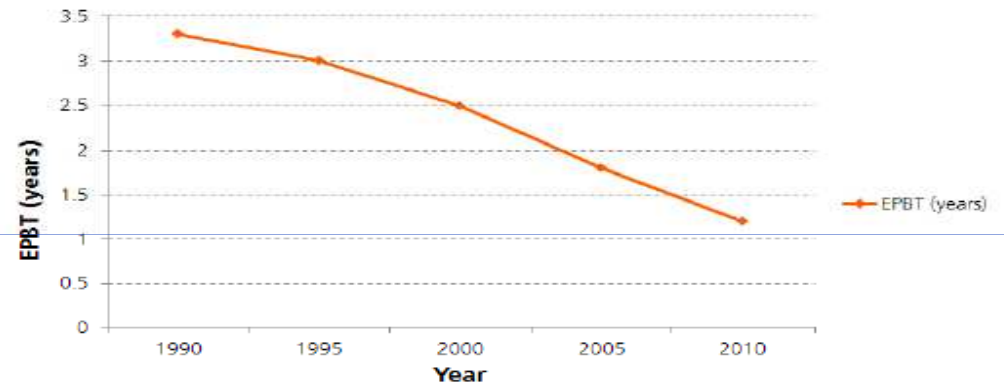
WEDNESDAY, JULY 6, 2011 | BY KEVIN BULLIS

Audio »

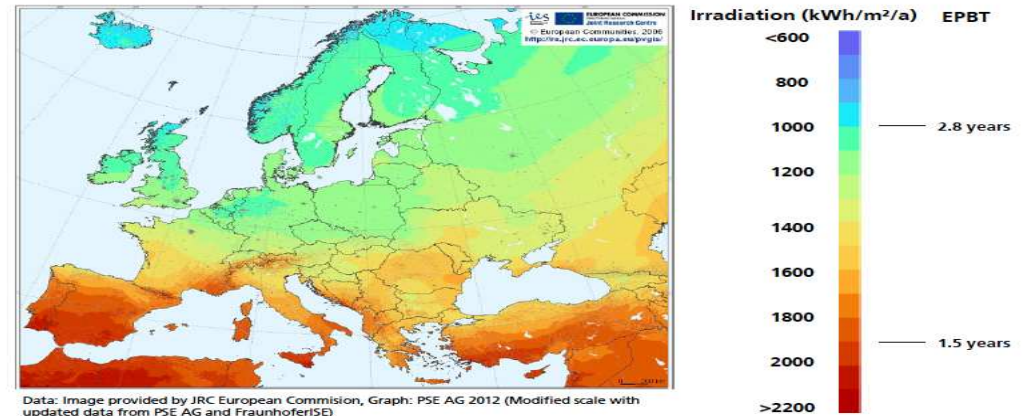
Face of solar: Suntech's headquarters building in Wuxi, China, which features a solar façade, is also its main solar cell manufacturing facility. Credit: Suntech

Five years ago only one of the 10 largest solar cell producers was based in China. But by last year, four of the top five were based there, and each is growing fast: all four doubled their production last year. It's widely believed that this success is due to low labor costs, but Stuart Wenham, CTO of the largest solar cell maker in China, Suntech Power, argues that the real causes are advances in manufacturing technology that have improved solar cells' performance and cut costs.

## Rooftop Installations in Southern Europe (1700 kWh/m<sup>2</sup>/a)



## Energy Pay-Back Time of Multicrystalline Silicon PV Systems - Geographical Comparison



## Suntech Sets World Record 20.3% Efficiency for Pluto Cell Technology

2 messages

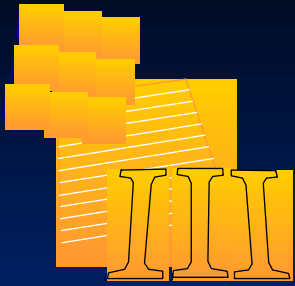
ir@suntech-power.com <ir@suntech-power.com>  
 Reply-To: ir@suntech-power.com  
 To: E-SUNTECH <s.wenham@unsw.edu.au>

Mon, Mar 12, 2012 at 11:01 PM

### Suntech Sets World Record 20.3% Efficiency for Pluto Cell Technology

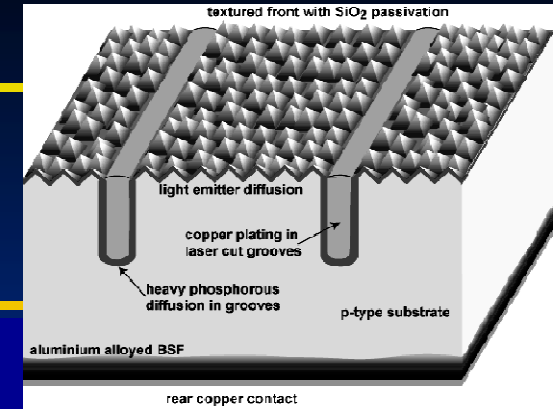
WUXI, China, March 12, 2012 /PRNewswire-Asia/ -- Suntech Power Holdings Co., Ltd. (NYSE: STP), the world's largest producer of solar panels, today announced that its industry-leading Pluto cell technology set a world record 20.3% efficiency for a production cell using standard commercial-grade p-type silicon wafers.

Developed by Suntech's research and technology development (R&D) team, in collaboration with the University of New South Wales, the incremental innovation in Pluto cell technology underscores Suntech's investment in R&D that delivers the best solar technology to its customers at an affordable price.

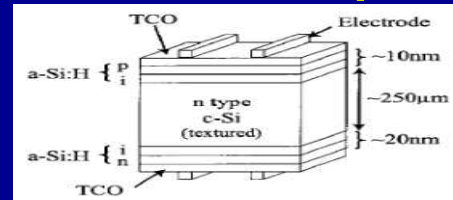


# Commercialisation of High Efficiency, Low Cost Technology

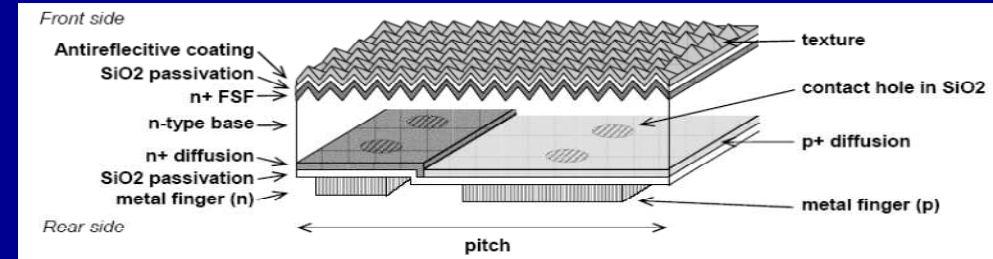
- **Buried Contact Solar Cells (Australian)**



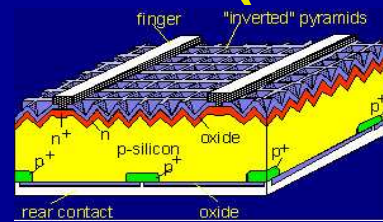
- **HIT cell (Japan)**



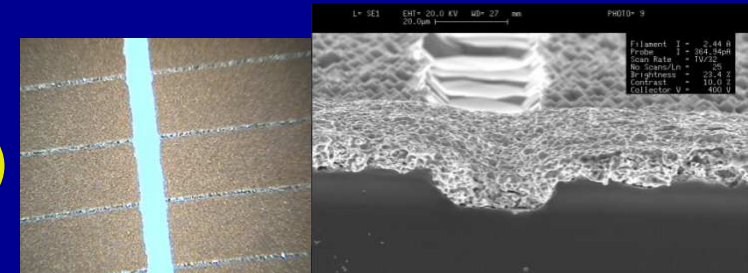
- **Rear Point Contact Cell (USA)**



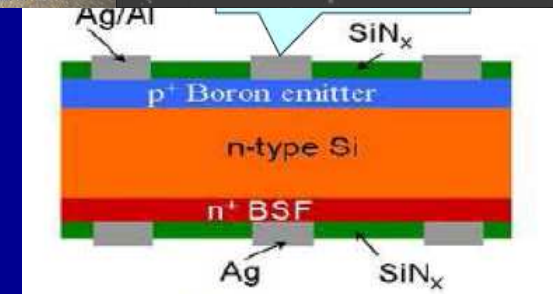
- **Pluto (Australia)**



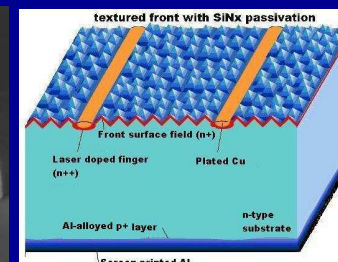
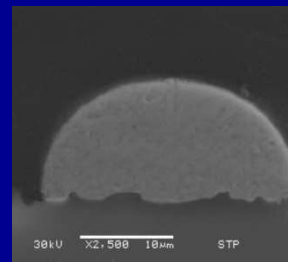
- **Semiconductor Finger Cells (Australia)**



- **Yingli n-type Panda technology (Netherlands)**

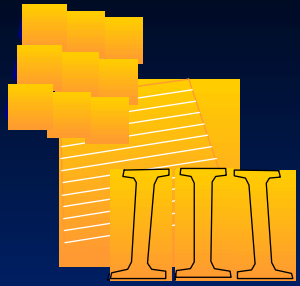


- **Laser Doping (Australia)**



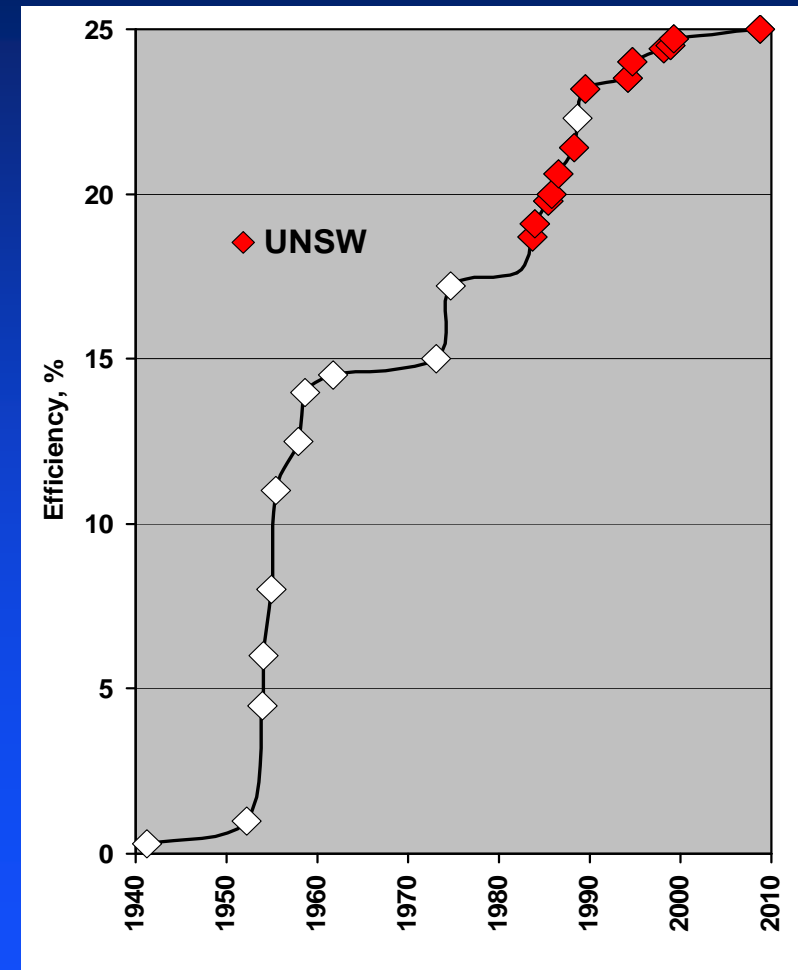
- **Sliver (Australia)**



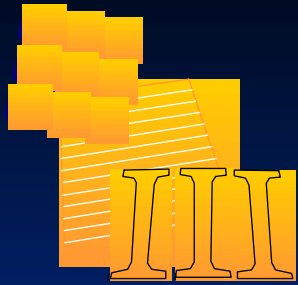


# Australia's success Commercialising PV Technology

- Technical Leadership
- Strong Industry Links

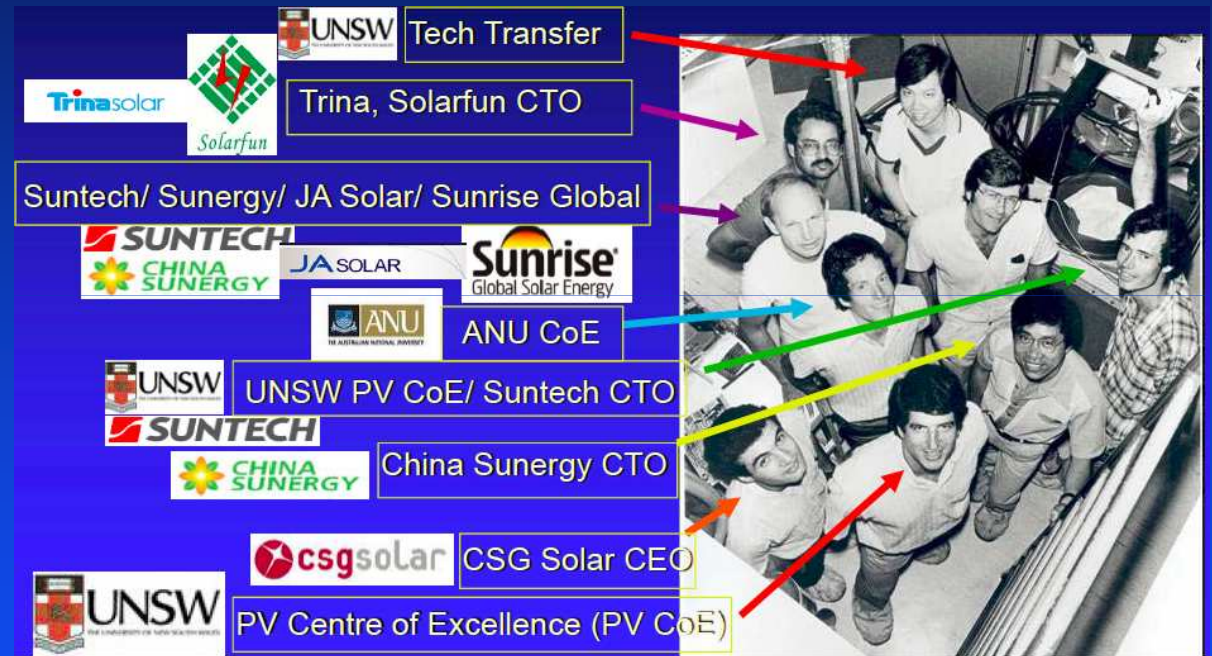


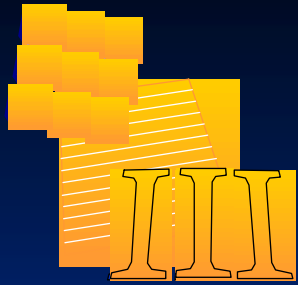
*Photovoltaics - Electricity from Sunlight*



# Leadership Positions Held by Former UNSW Students

- 6 x CEO' s
- 6 x VP of Technology
- 16 x CTO' s
- 2 x COO's
- 2 x Managing Director
- 6 x Research Director
- 5 x Company Directors
- 2 x Directors of Centre of Excellence




























## 22 former UNSW students as CTO's or VP's of Technology World-wide

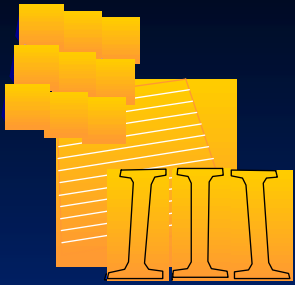
- Includes 8 of China's 10 largest cell manufacturers in present or former positions
- Guarantees Australia's continued technical leadership

\* denotes current position

Wenham Stuart	* Suntech-Power
Narayanan Mohan	Trina Solar
Song, Dengyuan	* Yingli Solar
Dai Ximing	JA Solar
Yun Fei	* LDK Solar
Yao, GuoXiao	JinkoSolar
Guo, Allen	* Jinko Solar
Narayanan Mohan	* Solarfun (Hanwha)
Wang Aihua	* China Sunergy

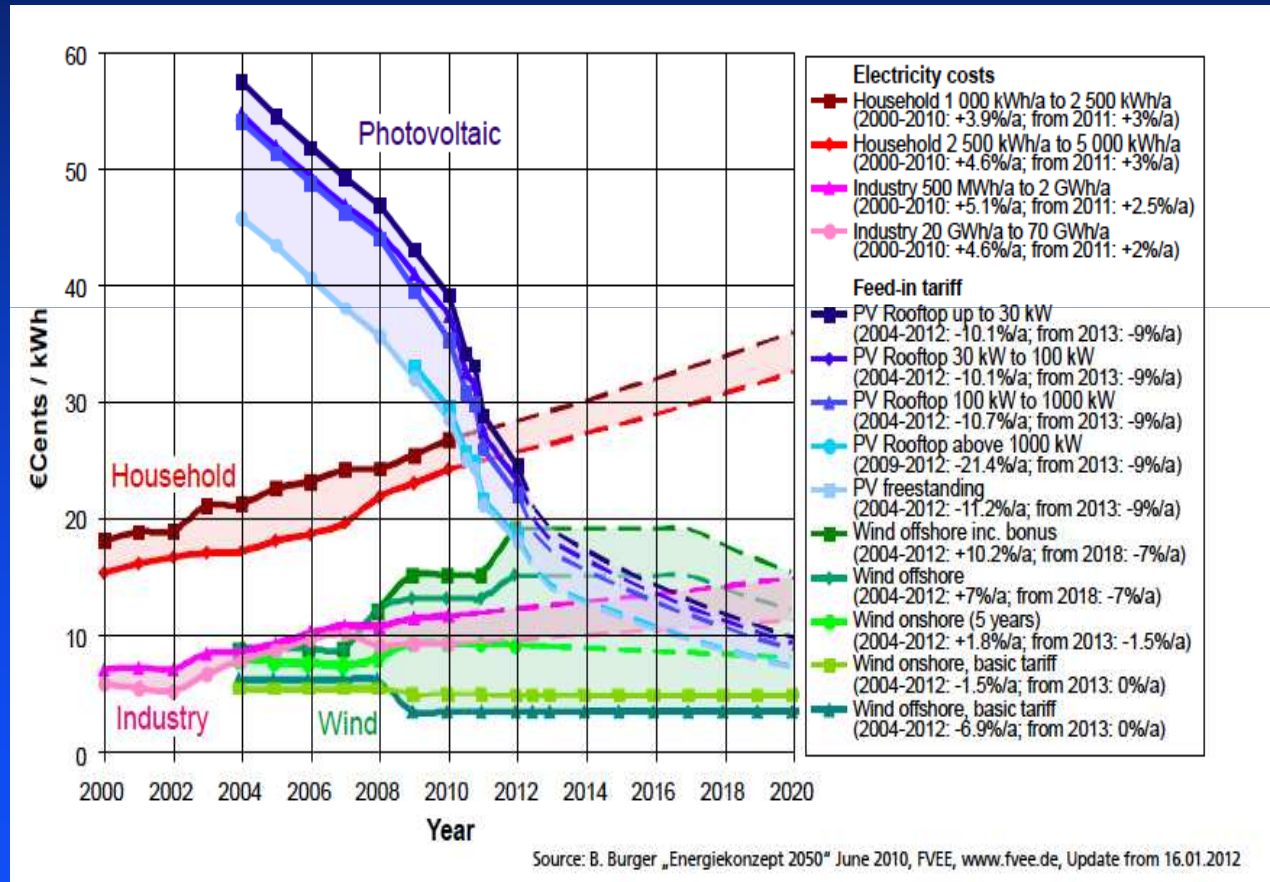
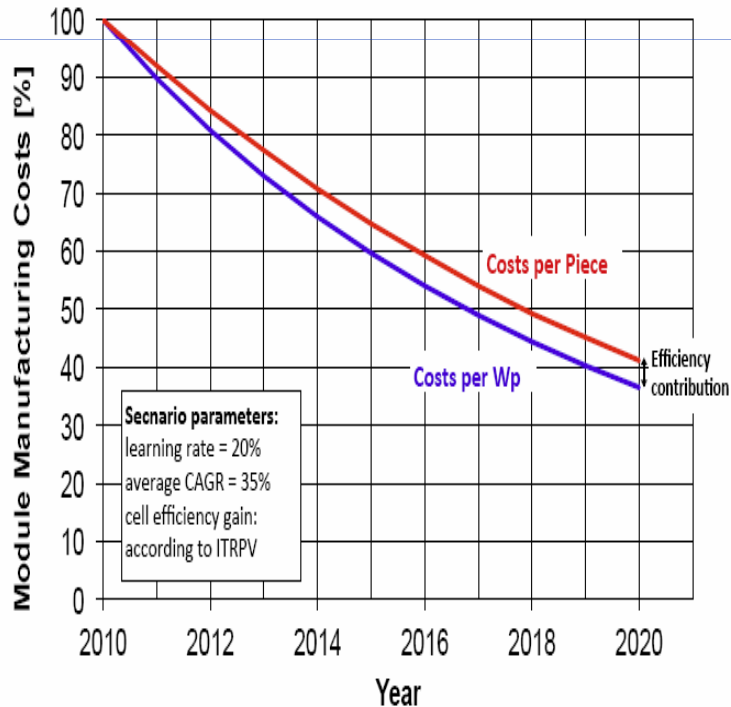
# China: Dominant in PV Manufacturing

2007	MW	2008	MW	2009	MW	2010	MW	2011	MW
	389		582		1100		1573		2096
	363		504		704		1400		1721
	336		494		595		1300		1711
	207		473		586		1100		1695
	200		300		525		1000		1623



# China has created the opportunity for PV electricity costs to undercut fossil fuels



- Prices will keep falling
- Experts predict halving of prices by 2020



You are here: [Home](#) / [Business & Economy](#) / Australia Could Be World's 1st Solar PV Mass Market, Yingli States

# Australia Could Be World's 1st Solar PV Mass Market, Yingli States

July 14, 2012 By [Giles Parkinson](#) [2 Comments](#)

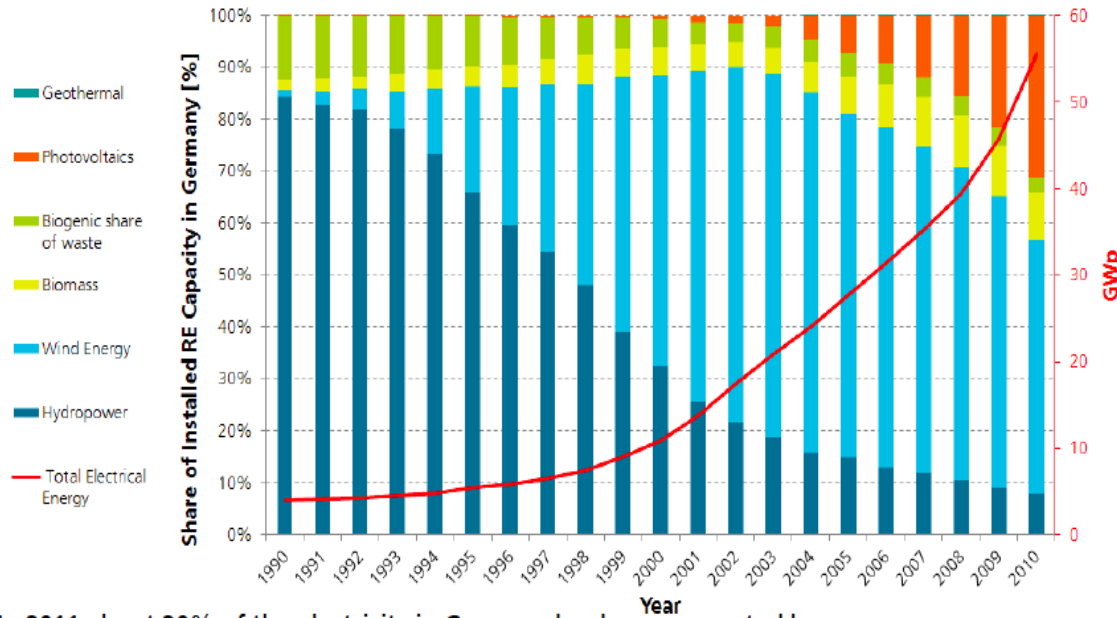
submit  32  3 33 2 1  
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One of the world's biggest solar PV manufacturers, Yingli Green Energy, has announced it will set up its regional headquarters in [Sydney](#) after concluding that Australia represents one of the most promising solar PV markets in the world.

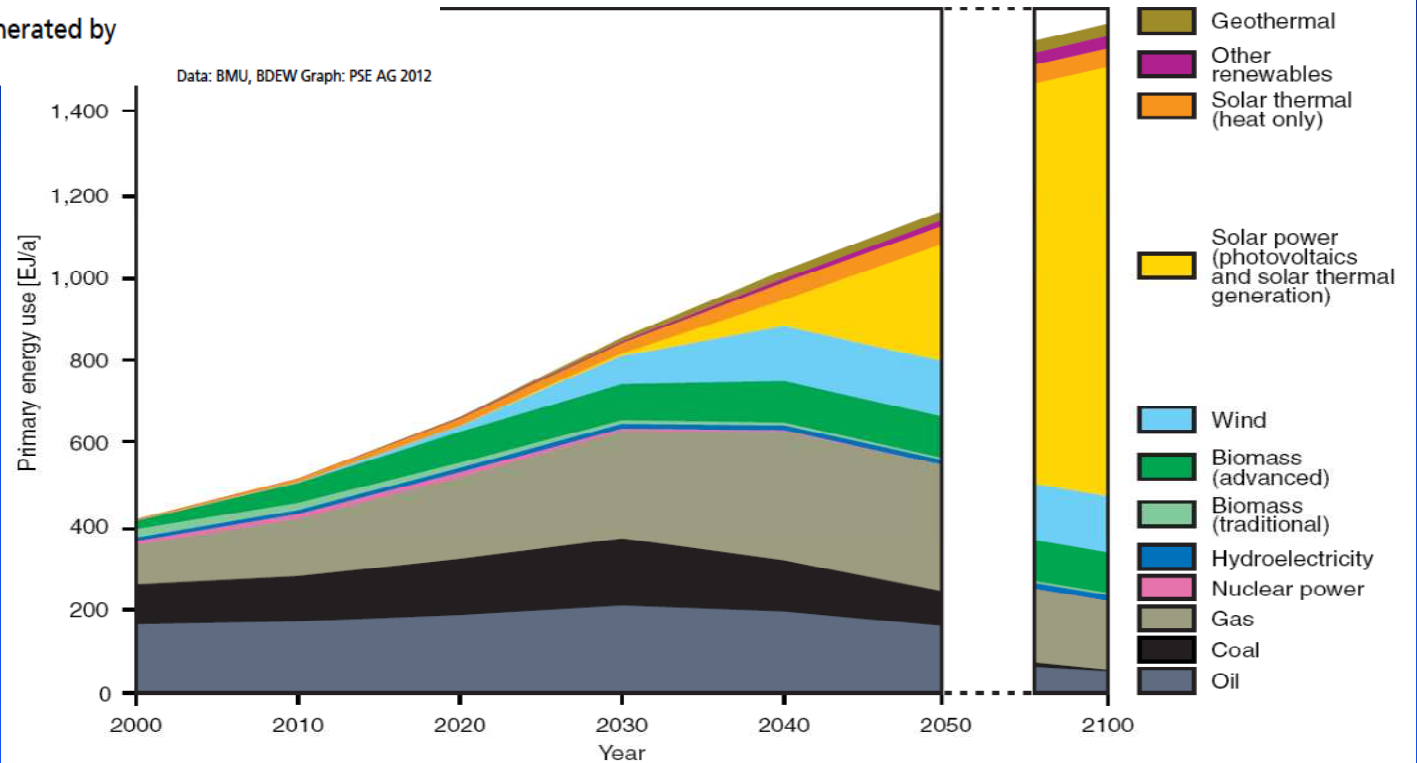
However, the company says Australia is set to be a “world leader” in coming years — the result of rising retail electricity prices, falling PV [costs](#), new financing options and a lot of sun. And as some of its principal partners move into the country, it has chosen to do so too.

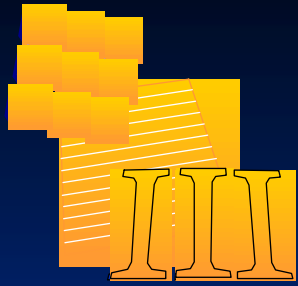
- Rules & Regulations around distributed generation will become significant

# Future Energy Sources – European Research Centre



In 2011 about 20% of the electricity in Germany has been generated by renewable energy (RE) sources according to BDEW





# Great Opportunities for Australia



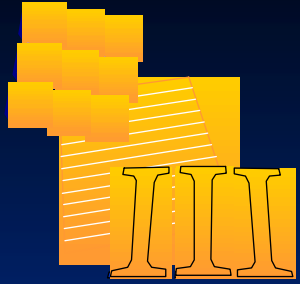
- Potential mass market with PV reaching grid parity provided suitable framework of rules and regulations established
- Provision of technology through licences (licences & agreements signed with many companies in >10 countries)
- Important role of ASI funding to ensure favourable IP policy
- Education – World's only PV Degree, >500 enrolled
- >40 former students in senior management positions of PV companies (US media has taken great interest in this)
- Abundance of sunshine
- Abundance of high purity silica.

UNSW

Photovolta







Thank You!