

# Grid Parity by 2012?

## ANZSES Queensland Branch

Russ Holmes & Rob Farago – Local Power  
[info@localpower.net.au](mailto:info@localpower.net.au)

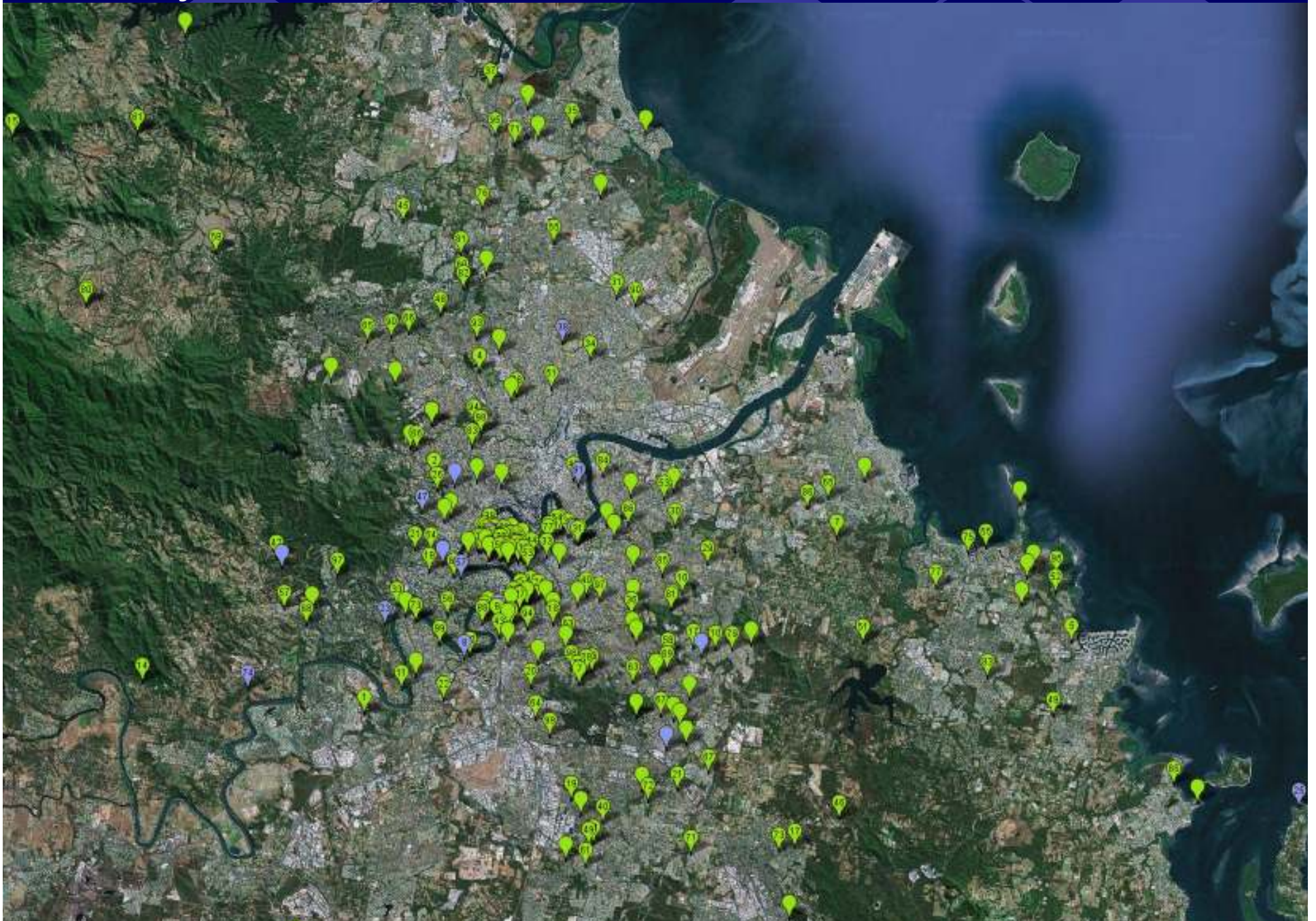
# Outline

- Local Power Buying Group
  - From cottage industry to mass market
  - Local Power system cost breakdown
- Australian PV Solar incentives
- How close are we to Grid Parity now?
  - What is Grid Parity?
  - Local Power grid parity model
- Some predictions
  - Country specific factors
  - PV system & panel prices
  - Silicon prices
  - Electricity prices
- Risks on the path to Grid Parity
- Conclusion
- Questions?

# Local Power Buying Group #1

- Wanting to reduce the cost of PV Solar
- Website launched in June 2007
- First Buying group in January 2008
- Quality components (sharp, fronius etc.)
- Good prices due to
  - Buy lots of components
  - Install them close to each other
  - Efficient admin & project management
- Wanted to offer under \$2000 1kW entry level
- 150 signups – had to close it early
- 200kW worth of systems
- 20+ tonnes of panels, inverters, frames etc.

# 250 systems installed in Local Power BG#1 & BG#2



# Local Power system cost breakdown

- 3kW fully installed Local Power BG#3 system cost in May 2009 = AUD \$8.05/Watt (inc-GST) breakdown being approx.
  - 74% panels
  - 10% inverter
  - 6% rails & misc. electrical
  - 10% install labour, cable, admin & logistics
- \$/Watt is interesting but we are more interested in c/kWh
- c/kWh is dependent on location (solar resource), panel degradation over time, etc.

# PVRRP/SHCP program

- PVRRP started in January 2000
- \$5.00/Watt capped at \$7500 -> **Boom!**
- In 2003 “to slow demand” became \$4.00/Watt capped at \$4000 -> **Bust.**
- May 2007 - \$8.00/Watt capped at \$8000 -> **Boom!**
- May 2008 - means tested @ \$100K family income -> **Bust? No! Boom!** (lots of retirees, single income families & single people)
- 8 June 2009 – Removed 22 days early due to explosive growth and “free” offers leading up to June 30.

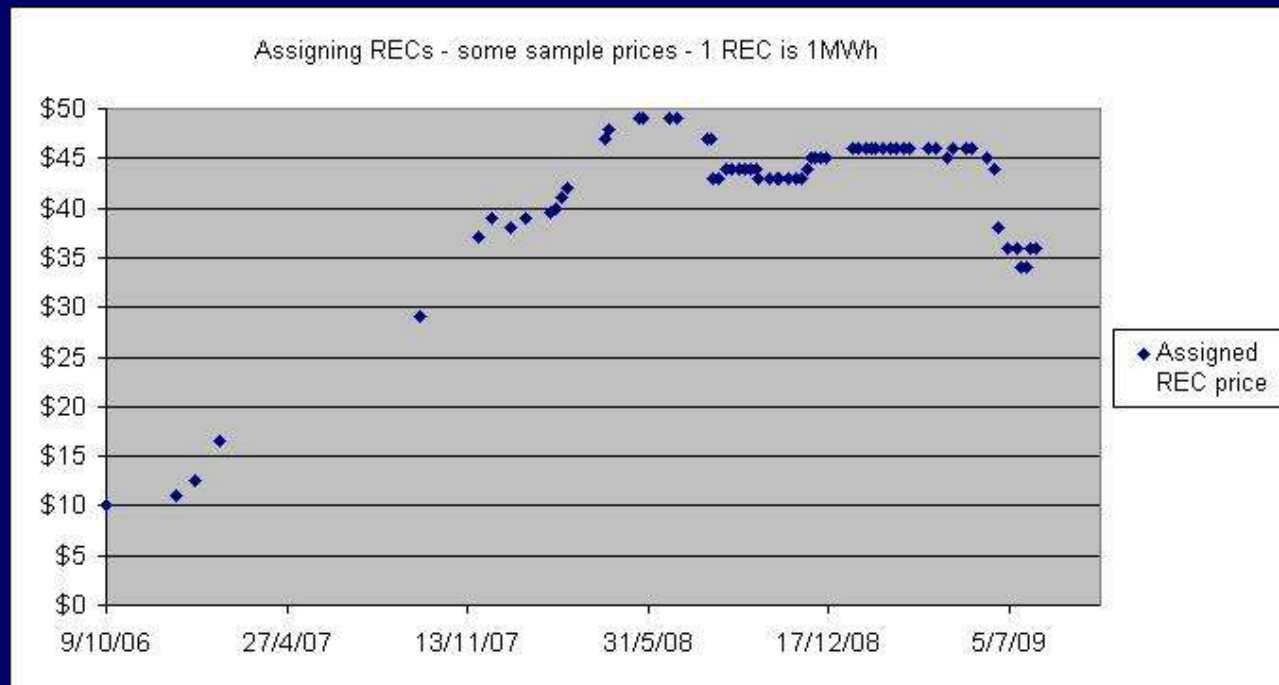
# MRET/RET/RECs

Mandatory Renewable Energy Target (MRET 2001) now RET (2009)

- Goal of 20% renewables by 2020
- Proposed Solar Credits Scheme available to all including businesses, investment properties.

A REC multiplier -> **Boom?**

- If it finally gets legislated (tied to CPRS) and
- assuming REC price doesn't collapse - oops



# Feed in Tariffs (FiT)

- Usually paid by electricity distributor (e.g. Energex) through the retailer (e.g. Origin, AGL etc.)

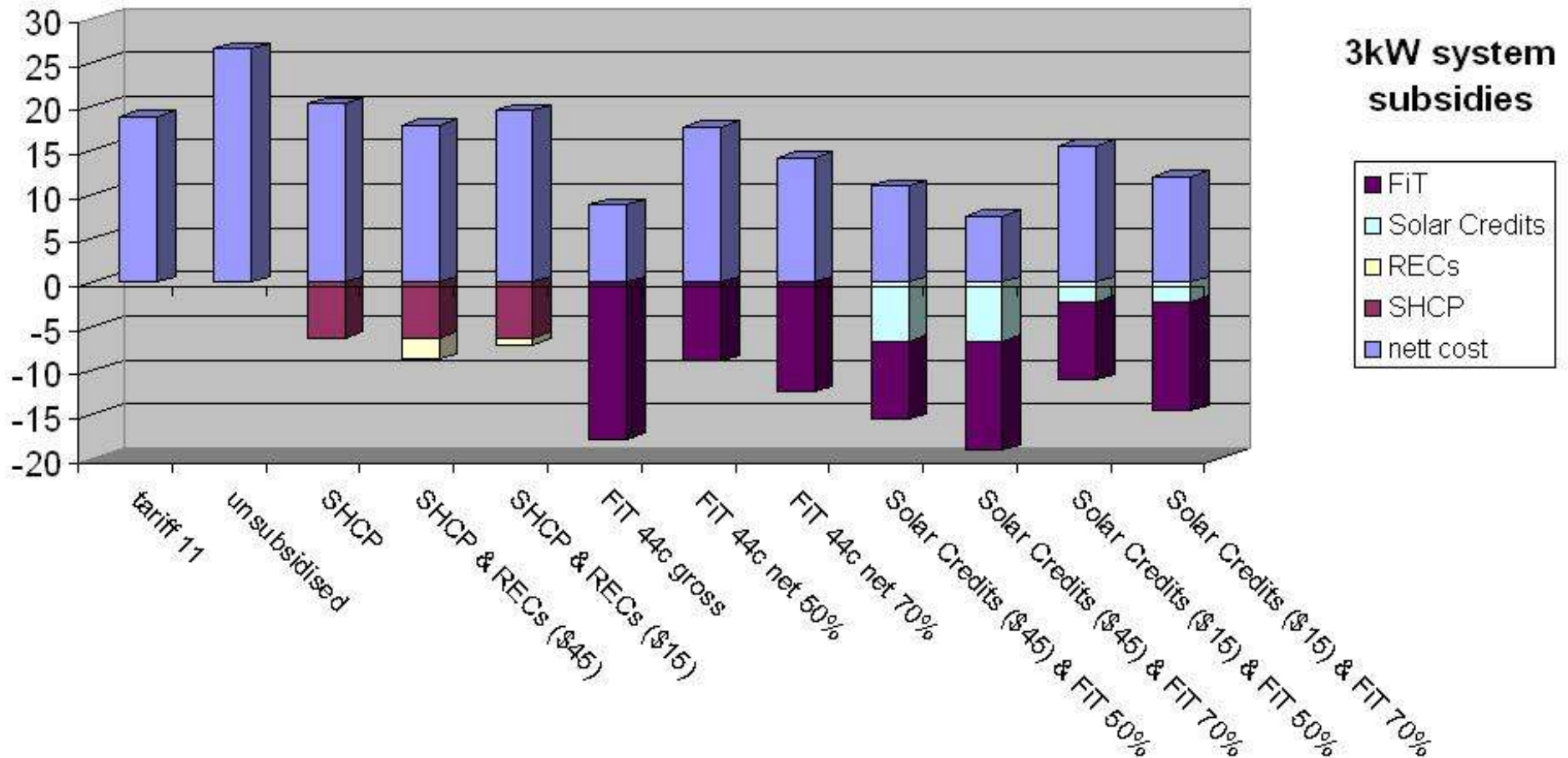
	FiT rate	Metering	Size (single phase)	Start	Life
SA	44c	net (import-export)	10kW	July 2008	20 years
Qld.	44c	net	10kW	July 2008	20 years
ACT	50.05c 40.04c	gross	<10kW 10-30kW	Mar 2009	20 years
Vic.	60c	net	5kW	2009	15 years
WA	??	gross then net		July 2010	
NSW	60c	net	10kW	Jan 2010	20 years



# What are the recent subsidies?

- Subsidies for our 3kW system
  - PVRP/SHCP Rebates - \$8000
    - 3kW – 6.3c/kWh
  - RECs
    - \$45 each - 2.4c/kWh
    - \$15 each – 0.8c/kWh
  - Solar Credits (first 1.5kW gets 5x RECs)
    - \$45 each – 6.7c/kWh
    - \$15 each – 2.2c/kWh
  - FiT for 20 years
    - 44c/kWh Gross – 17.8c
    - 44c Import-export (or net) @ 50% export - 8.9c/kWh
    - 44c Import-export @ 70% export - 12.4c/kWh

# What are the recent subsidies?

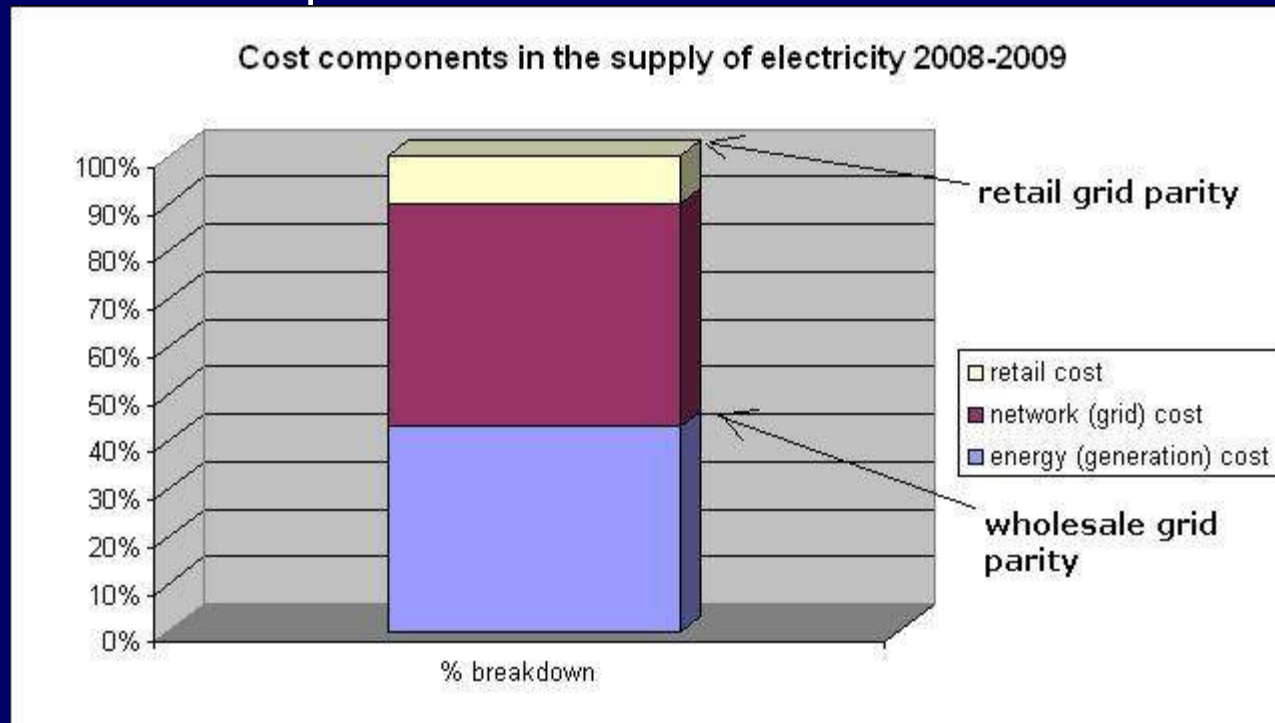


# Australian PV Solar Incentives

- Upfront Solar rebates (PVRP/SHCP 1kW) - Federal
- Renewable Energy Certificates (RECs) – Federal
- Solar Credits – (REC multiplier 1.5kW Solar) - Federal
- Feed in Tariffs (FiT) – State
- CPRS – eventually a negative incentive for fossil fuels - Federal
- In summary
  - Multiple incentives are complicated for customers
  - Uncertain level of incentives (RECs)
  - Parochial (FiT)
  - A political football (rebates)
- **We need to move beyond incentives!**

# What is Grid Parity?

- Retail Grid Parity is where the cost of electricity generated over the life of a PV system is less than the retail cost of electricity purchased from the grid.
- From 1 July 2009, retail electricity from the grid is 18.8c/kWh in Queensland.
- A retail bill is composed of \*



localpower.net.au

\* <http://www.qca.org.au/files/ER-NEP910-QCA-DraftDecBRCI-Report-1208.PDF>

# How close are we to Grid Parity now?

- Local Power Grid Parity model
- for simplicity let's ignore for now
  - Finance/interest/opportunity costs
  - inflation effects
  - maintenance costs
- but let's consider
  - panel performance degradation over time
  - PV system cost decreases
  - electricity cost increases over time
  - inverter lifetime and replacement cost

# How close are we to Grid Parity now?

- May 2009 **unsubsidised** Local Power c/kWh
  - 3kW system – 26.6c/kWh
  - Tariff 11 residential is 18.84c/kWh
- Assumptions in model
  - 3kW PV system fully installed
  - 4.2kWh / kW generation per day in Brisbane
  - then 1% panel performance degradation each year
  - PV component lifetime of 30 years (panels, rails, cables)
  - Inverter has 10 year life (extended warranty)
    - Replace inverter after year 10 & year 20

# How close are we to Grid Parity now?

Assumed annual increase in electricity price for next 30 years	decrease required in initial PV system cost	Years to payback of system cost (grid parity)	Comments (NB all scenarios below assume no PV incentives)
0%	40%	30	Will electricity prices decrease in real terms?
3%	0%	29	Grid parity now?
3%	22%	25	2012?
3%	44%	18	2017?

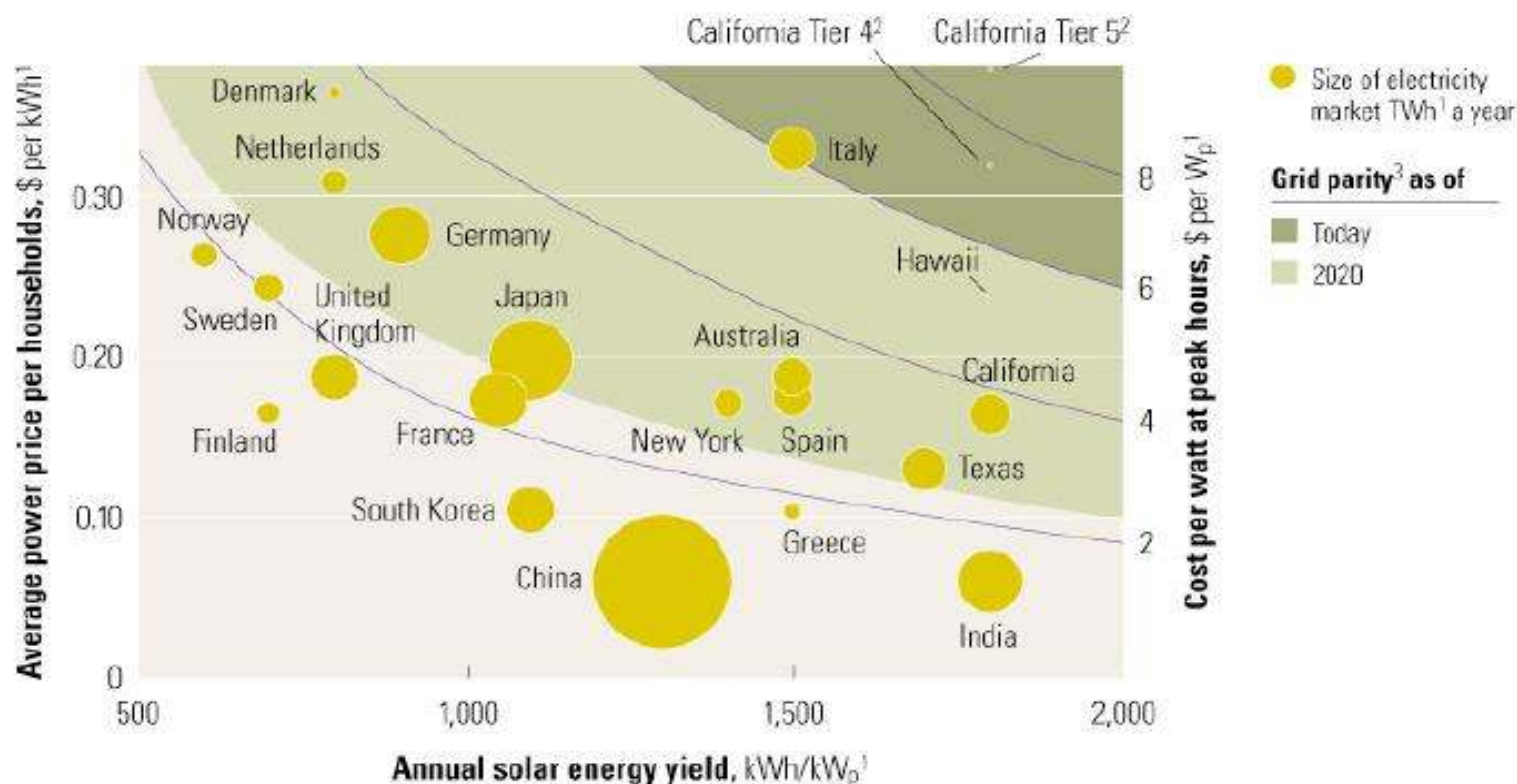
# How close are we to Grid Parity now?

- Still need subsidies for next few years
- Number of years depends on
  - PV system price drop and
  - electricity price rise



# Country specifics - McKinsey

## The growing competitiveness of solar power



<sup>1</sup>kWh = kilowatt hour; kW<sub>p</sub> = kilowatt peak; TWh = terawatt hour; W<sub>p</sub> = watt peak; the annual solar yield is the amount of electricity generated by a south-facing 1 kW peak-rated module in 1 year, or the equivalent number of hours that the module operates at peak rating.

<sup>2</sup>Tier 4 and 5 are names of regulated forms of electricity generation and usage.

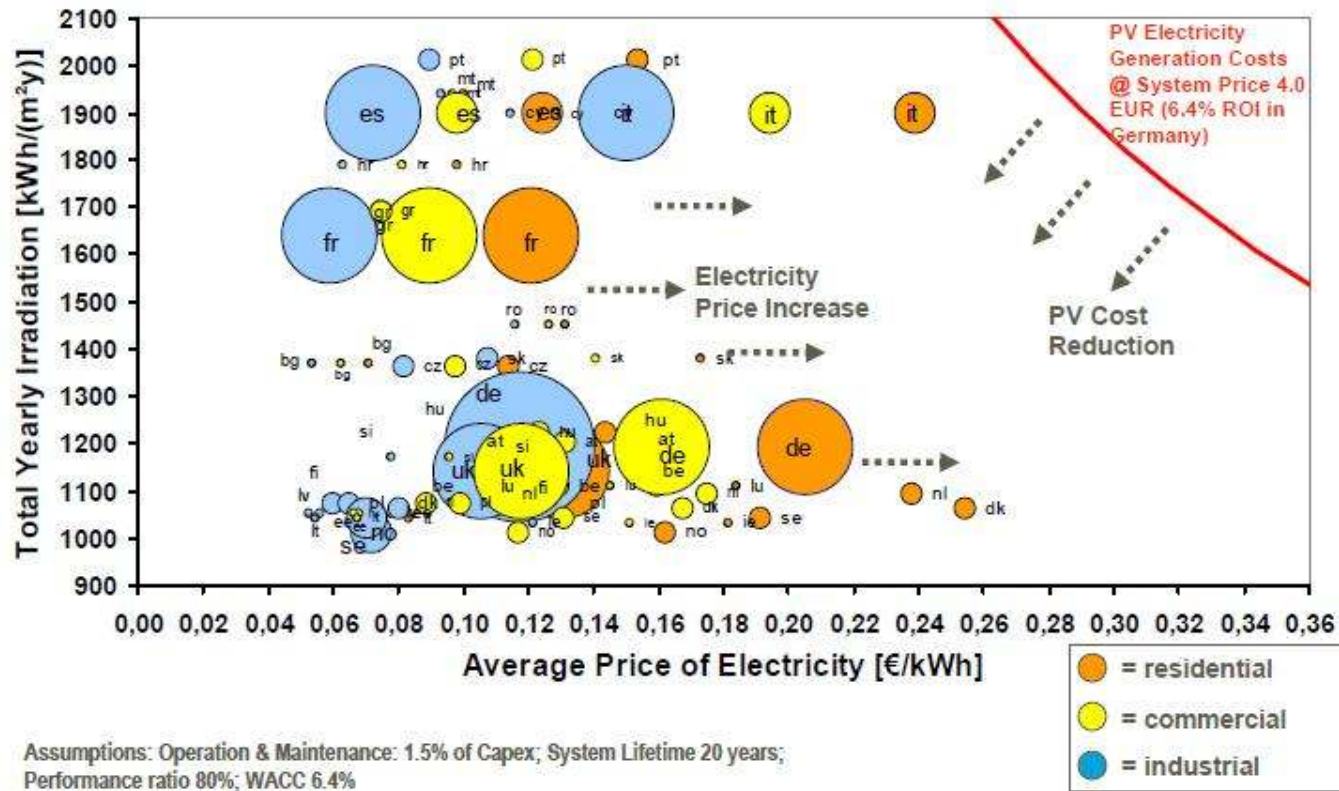
<sup>3</sup>Unsubsidized cost to end users of solar energy equals cost of conventional electricity.

Source: CIA country files; European Photovoltaic Policy Group; Eurostat; Pacific Gas & Electric (PG&E); Public Policy Institute of New York State; McKinsey Global Institute analysis

# Country specifics – Q-Cells

“Italy’s residential market has achieved grid parity, while Germany residential market should get there by 2012.” \*\*

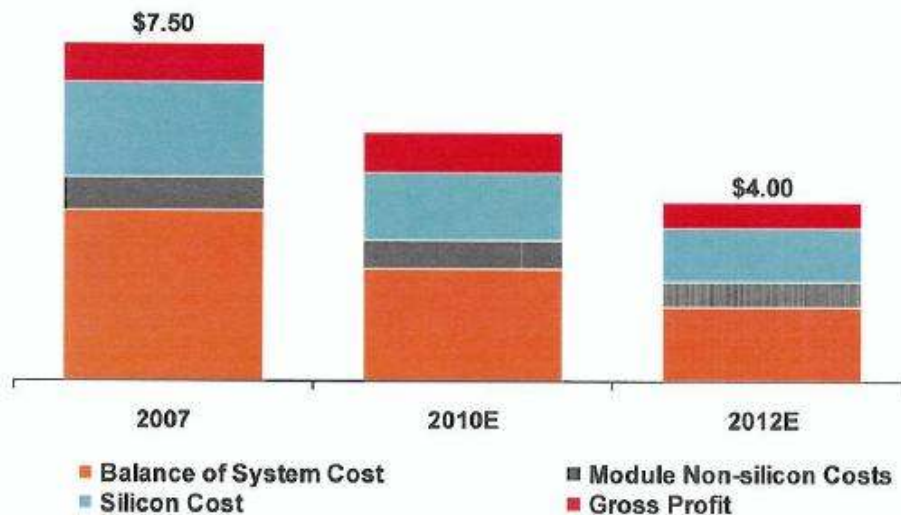
## MARKET – GRID PARITY IN EUROPE



# System & panel prices - Suntech

## 2012 Grid Parity Solar Moving to Grid Parity System Costs<sup>1,2</sup>

- Suntech's combination of lower cost silicon, increasing efficiency and significant economies of scale are expected to enable significant reduction in module pricing by 2012.
- Advances in technology and mass production of balance of system components (BOS); including racking, inverters, labor saving technologies etc. expected to reduce BOS to grid parity compatible costs by 2012.



\$4.00/watt system cost in 2012 with irradiation of 1600 hrs per year leads to solar electricity cost of \$0.18-0.20/kWhr<sup>2</sup>

**GRID PARITY SOLAR**

- (1) COGS declining based on Company expectations of PV cell conversion efficiency improvement from Pluto technology, improvements in operating efficiency, expectations of declining cost of wafers, and no significant foreign currency exchange fluctuation. Assumes Balance of System Costs fall by approximately 15% YOY
- (2) Based on Company estimates. Assumes 20 year system lifetime based in California, efficiency degradation rate of 1% for 10 years, retail electricity rate increase of 3% per year, IRR of 5%.



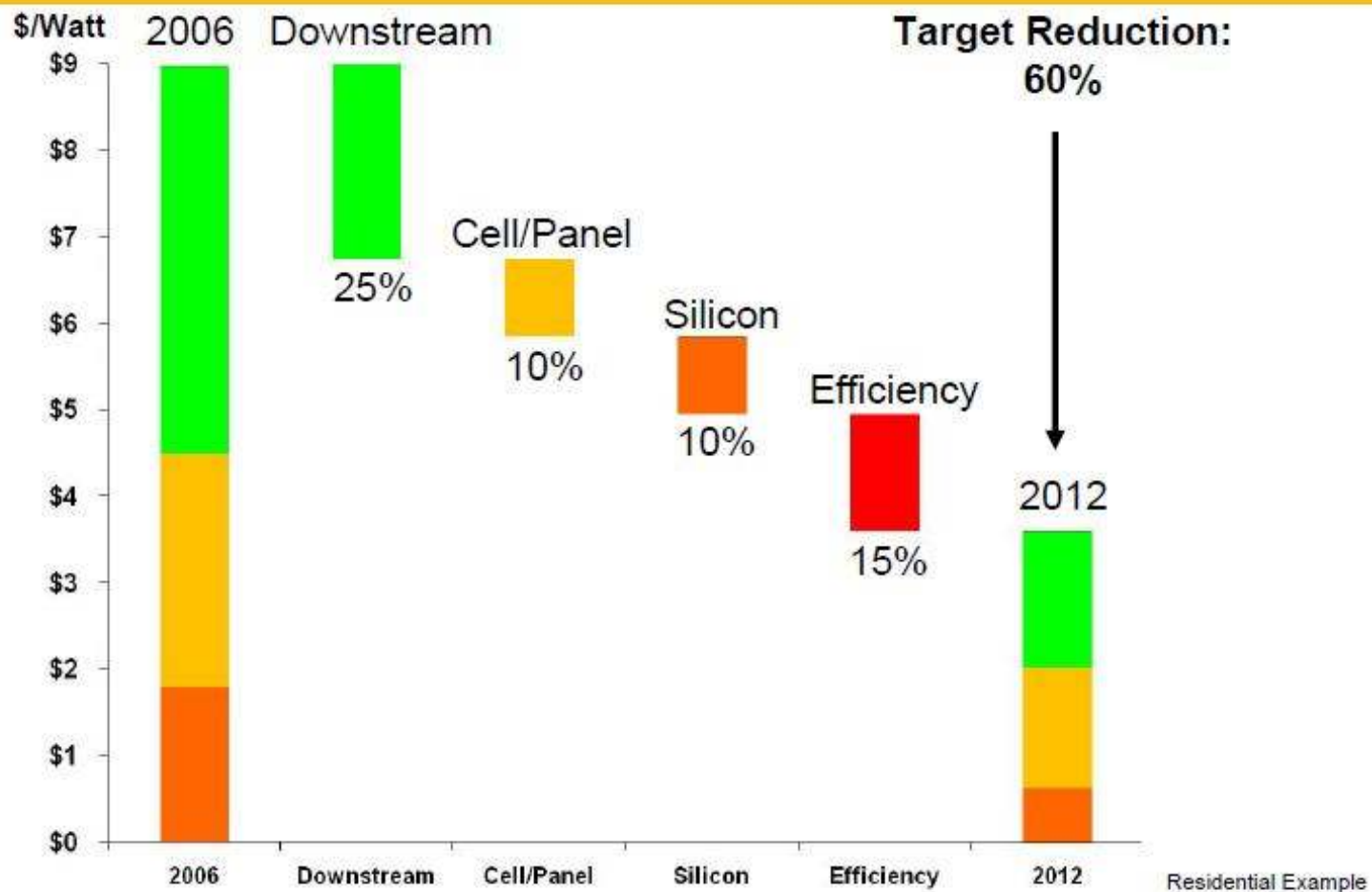
“between 2012 and 2015, depending upon take-up, Suntech Power forecasts that solar PV will achieve grid parity, which means that a consumer who chooses to take up a solar PV system will be paying effectively with their investment in their installation cost basically the same price that electricity will cost off the grid.” \*\*

\*\* p19 of <http://www.aph.gov.au/hansard/senate/commtee/S11165.pdf> 11/8/2008

Document with page above tabled at “Save our Solar” Senate inquiry hearing in Brisbane

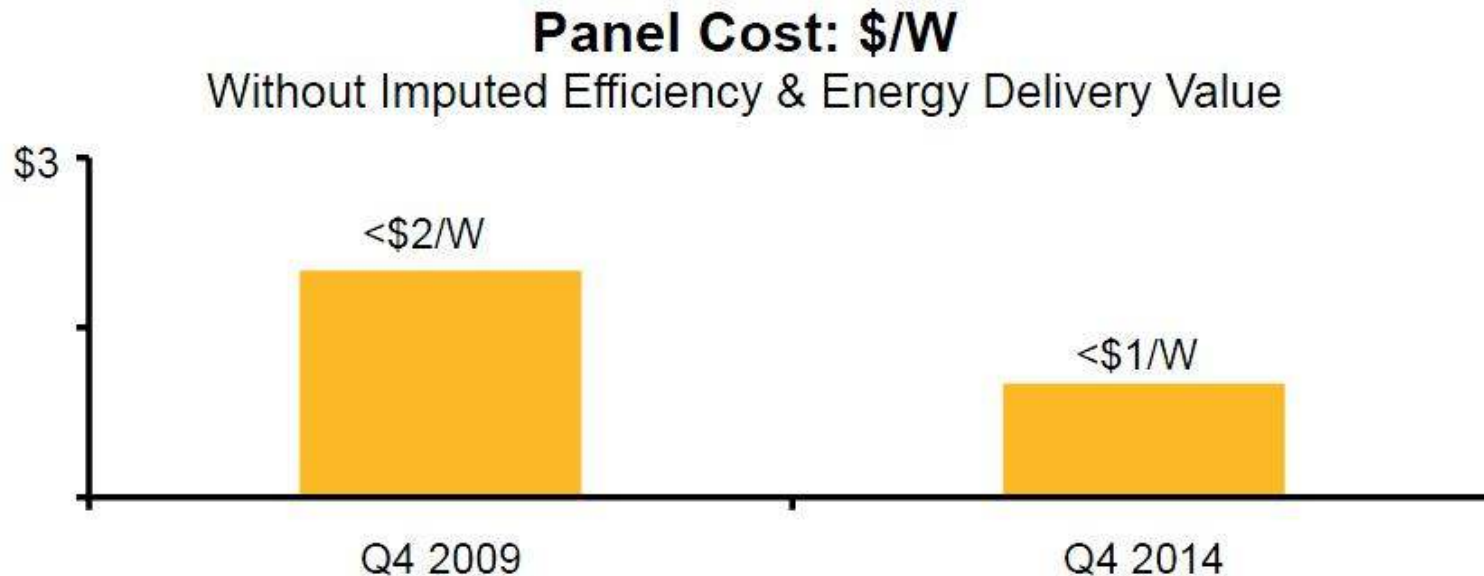
# System & panel prices - Sunpower

## Installed Cost Reduction Roadmap Plan: 50% by 2012



# System & panel prices - Sunpower

## Panel Technology Roadmap Ahead of Schedule



### Major Cost Reduction Drivers

- Conversion Efficiency
- Silicon Utilization
- Manufacturing Scale
- Manufacturing Yield

1) Panel costs do not include any BOS

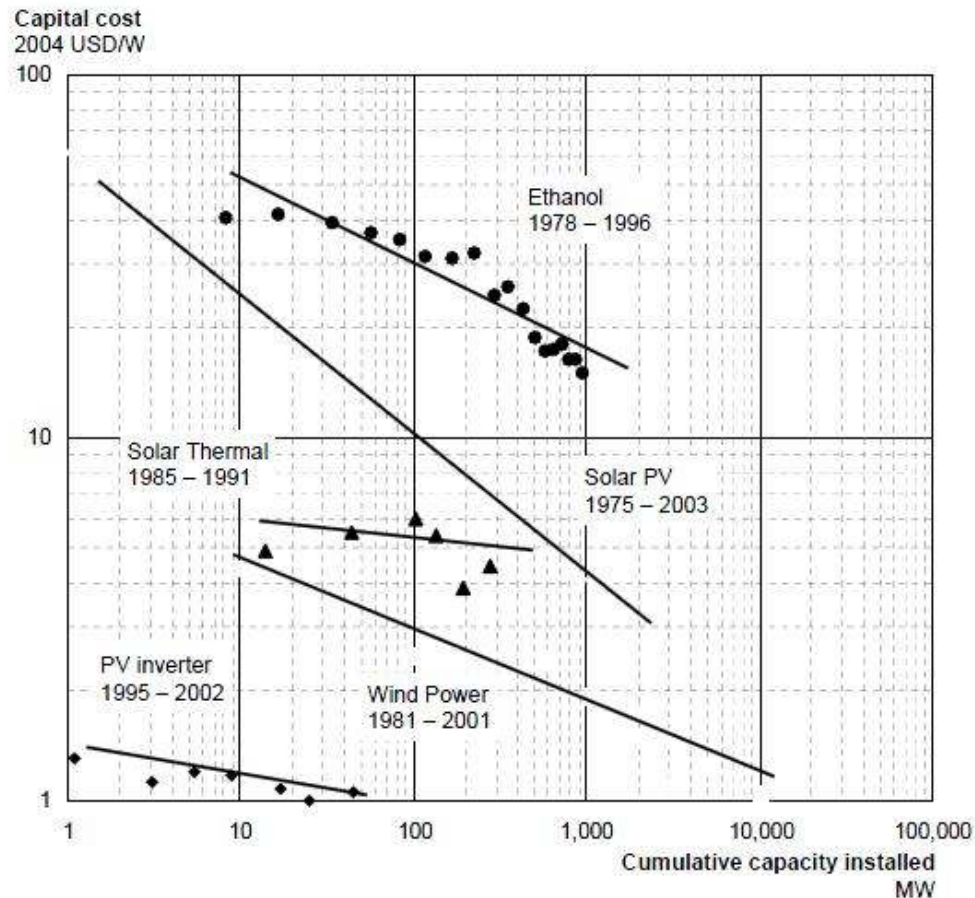
SUNPOWER™

10

21

# System & panel prices - Vattenfall

## Historical cost development for renewables, and assumptions going forward

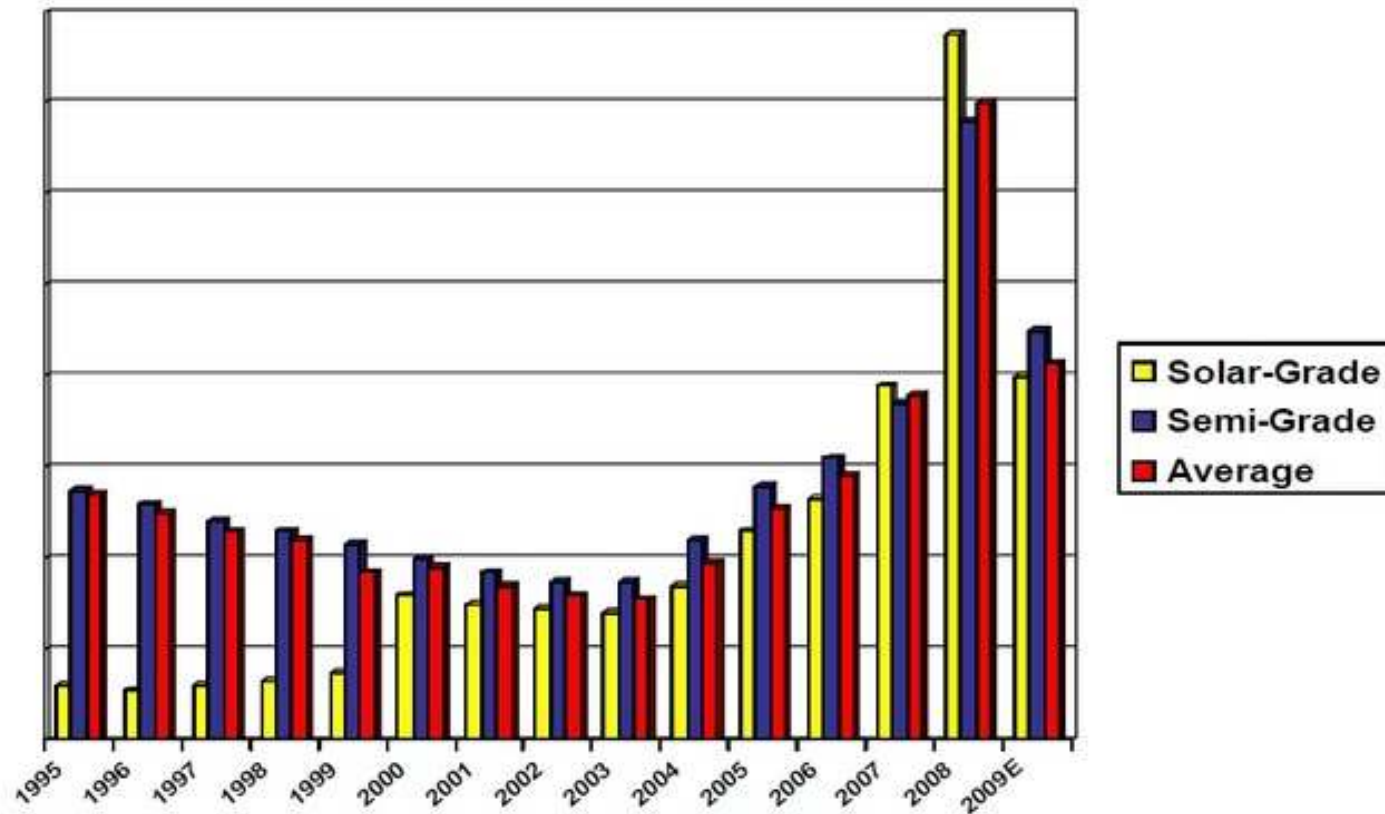


\* Other sources indicate learning rates as low as 18% for solar PV  
Source: UC Berkeley Energy Resource Group; Navigant consulting

- Historical learning rates (i.e., cost decreases) per doubled cumulative capacity of
  - 23% for Solar PV\*
  - 13% for Wind Power
  - 15% for Ethanol
  - 6% for PV inverters
  - 3% for Solar Thermal
- 80% of historical learning rates have been assumed through 2030 in our model
  - 18% for solar PV modules
  - 11% for wind
  - 11% for geothermal
  - 5% for small hydro
  - 5% for biomass

# Silicon prices - Hemlock

## Global Polysilicon Estimated Price History\*

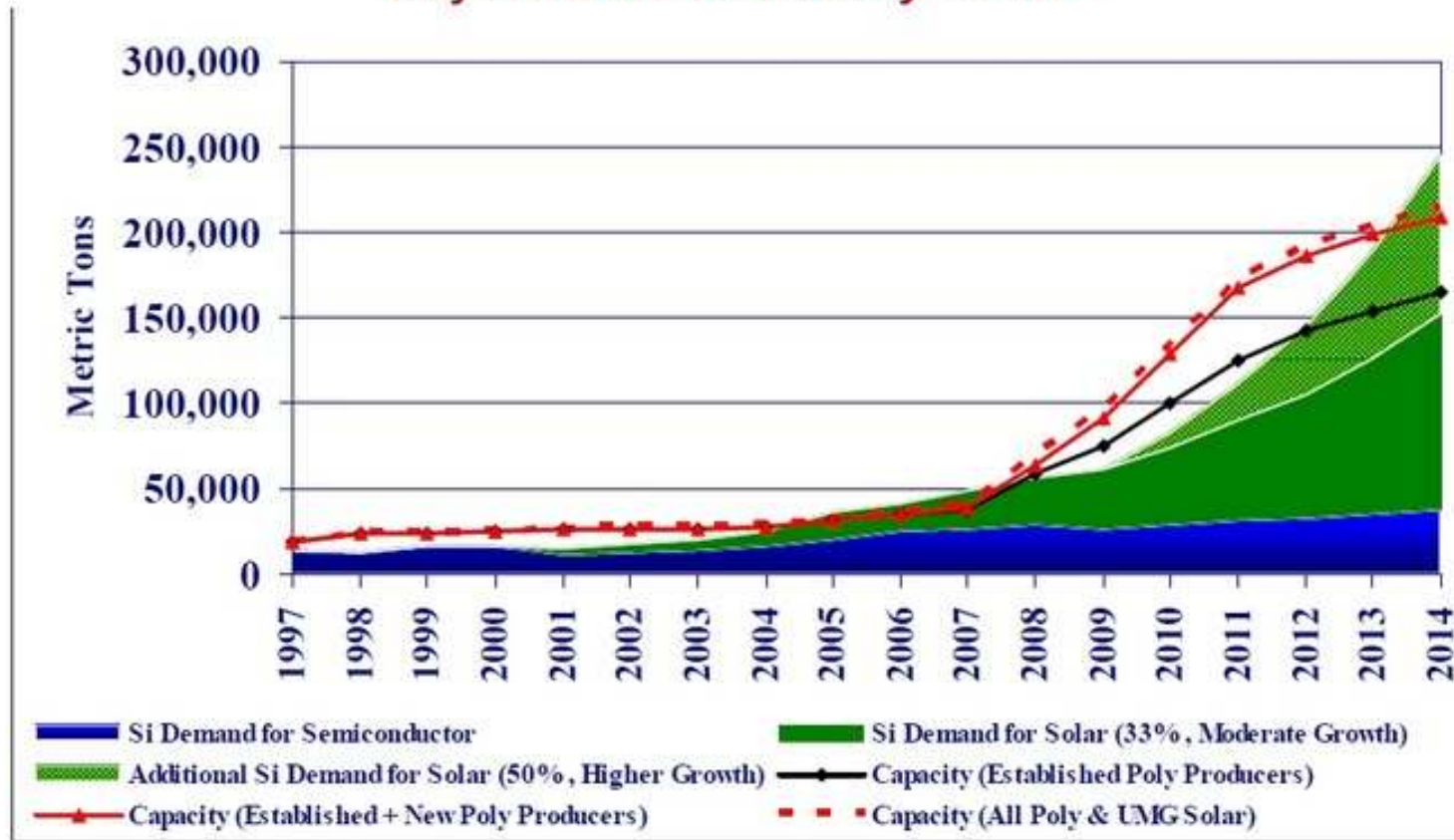


\*Source: Public information and internal research by HSC

Gary Homan  
June 2009

# Silicon prices - Hemlock

## HSC's Global Polysilicon Supply/Demand Forecast *Adjusted for Grid Parity Costs\**



\*Source: Public information and internal research by HSC

Gary Homan  
June 2009



# Electricity prices

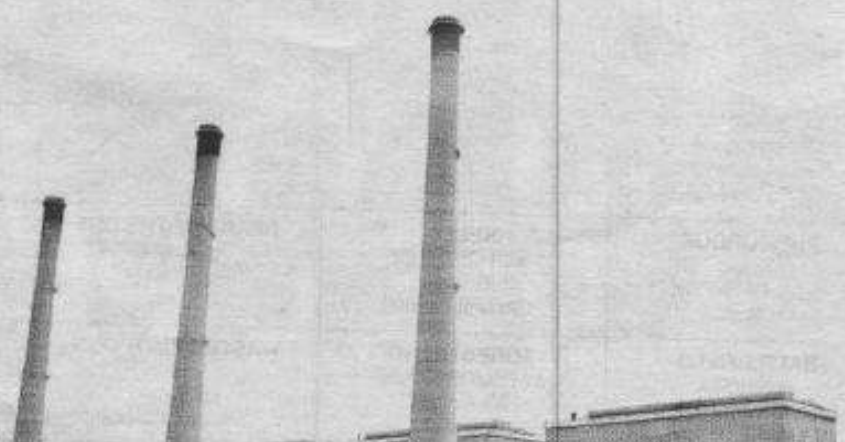
## Powerful forces double your bills

If you think this month's 15 per cent plus increase in electricity prices is shocking, just wait.

Australia's power generators predict that retail prices could double by 2020 because of the Federal Government's proposed carbon pollution reduction scheme and planned renewable energy targets.

The Federal Government disagrees, but even its own studies point to a 20-25 per cent increase "in the initial years" of the new regime, scheduled to begin in 2011.

And the State Government, despite its claims that it is doing all it can to keep price rises to a bare minimum, is actually adding to the upward price pressure.



Courier Mail Saturday 4 July 2009. Electricity prices could double by 2020 due to combination of RET, CPRS and \$9 Billion in electricity grid (transmission & distribution) investments in Queensland over the next 5 years by Energex, Ergon & Powerlink (grid charges are around 47% of the retail bill)

# Risks on the path to Grid Parity

- If electricity prices don't increase due to
  - grid investments for peak (aircon related) generation
  - RET and carbon costs
- If PV panel prices don't decrease due to
  - increased economies of scale
  - silicon price decreases
  - increased conversion efficiencies
- If PV other component prices don't decrease due to
  - Volume manufacture of inverters, mounting systems etc.
  - More experience in installations
- Existing subsidies won't remain until grid parity
- Some Wildcards
  - Climate will change and decrease annual generation
  - increased storms will reduce life or damage PV systems etc.
  - Energy efficiency adoption will reduce demand for electricity holding down generation costs

# Conclusion

- Historical PV price reductions follow down a learning/experience curve
- Silicon price drops will again allow this to continue
- Electricity prices will continue to increase
- Solar subsidies needed for a few more years yet
- PV industry knows they need grid parity and are working to get there

# Any Questions?



[localpower.net.au](http://localpower.net.au)

11 August 2009