



**Enecsyst**

Cleanpower 2009 Conference

*Paul Engle, CEO*

*June 2009*



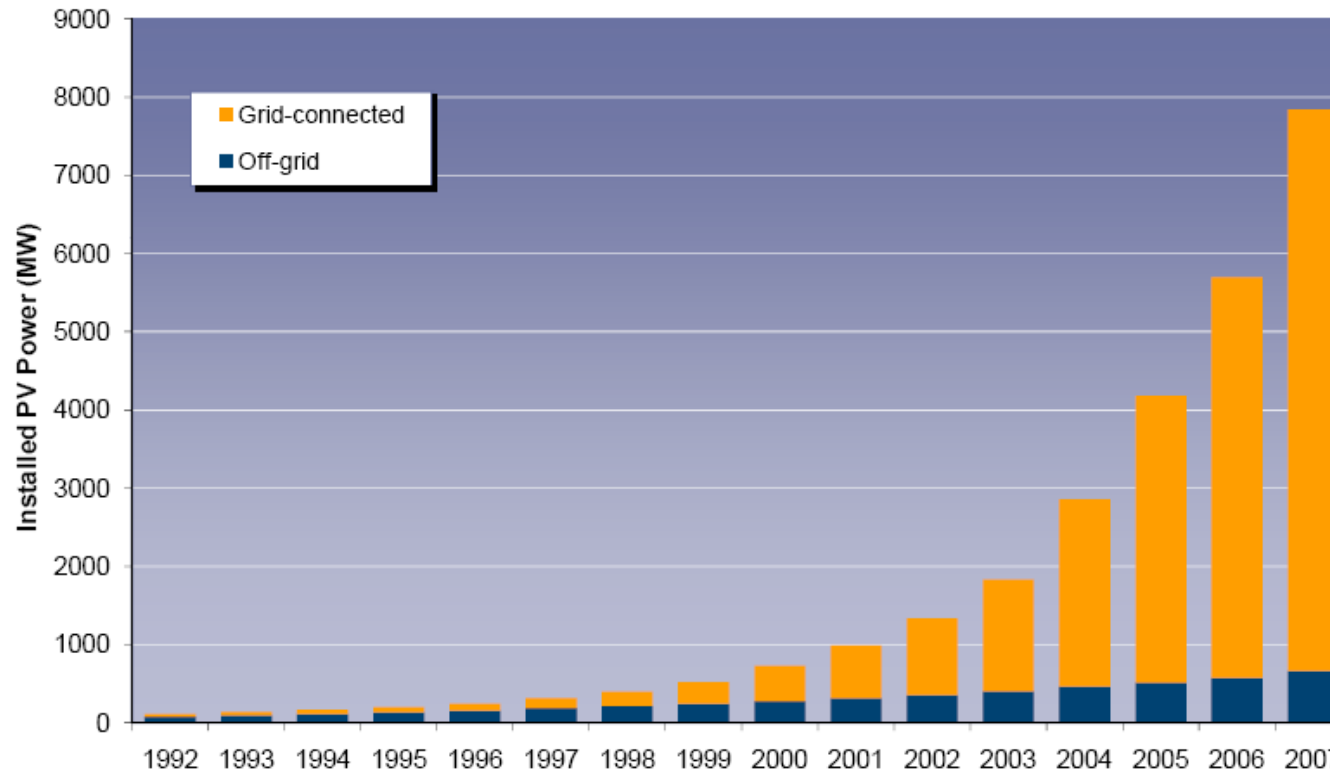
## Vision Statement & Company Objective

***Enecsys' vision is to accelerate grid-connect solar power deployment using disruptive technology to create simpler PV systems with superior economic returns and enable large previously inaccessible markets***

***With the launch of its first product in 2009 Enecsys is to capture leading market share of the solar inverter business resulting in Enecsys revenues exceeding \$500 million by 2013 with >20% net margin***



## Solar PV Installations Market

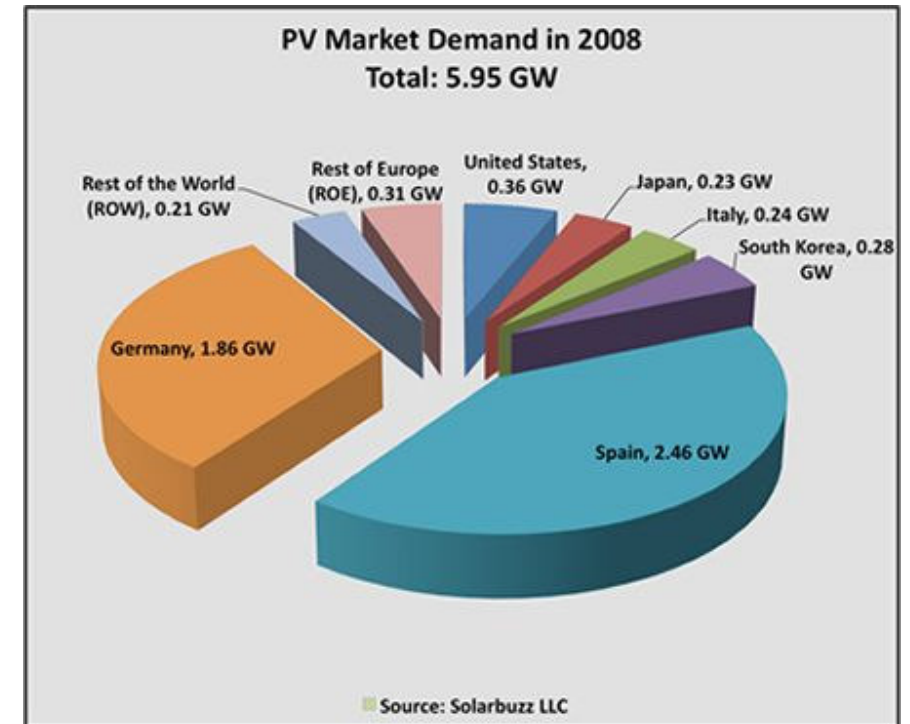
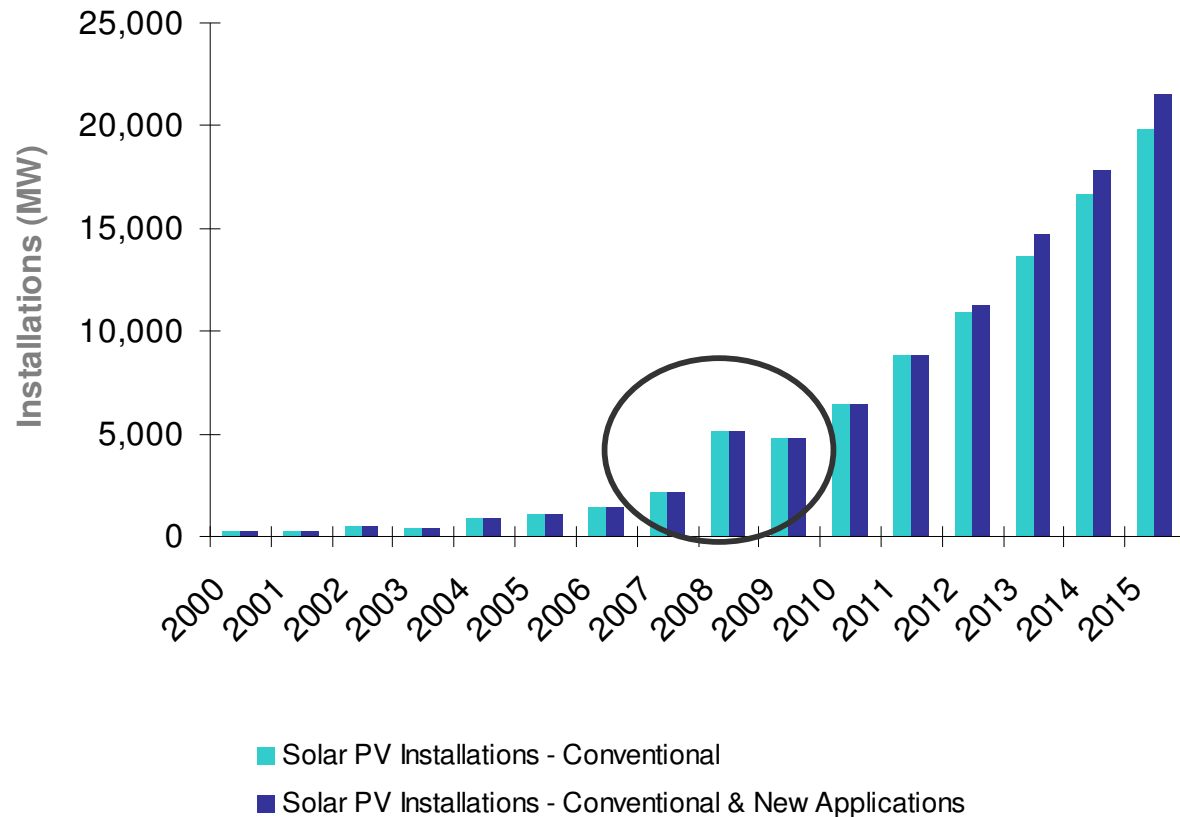


Solar has grown at an average CAGR of 35% driven by:

- Environmental issues
- Energy security
- Feed-in tariffs and subsidies
- Availability of financing
- Increasing conventional energy cost
- Falling cost of solar systems
- Improving solar conversion efficiency



## Solar Grid Connect PV Installations Market

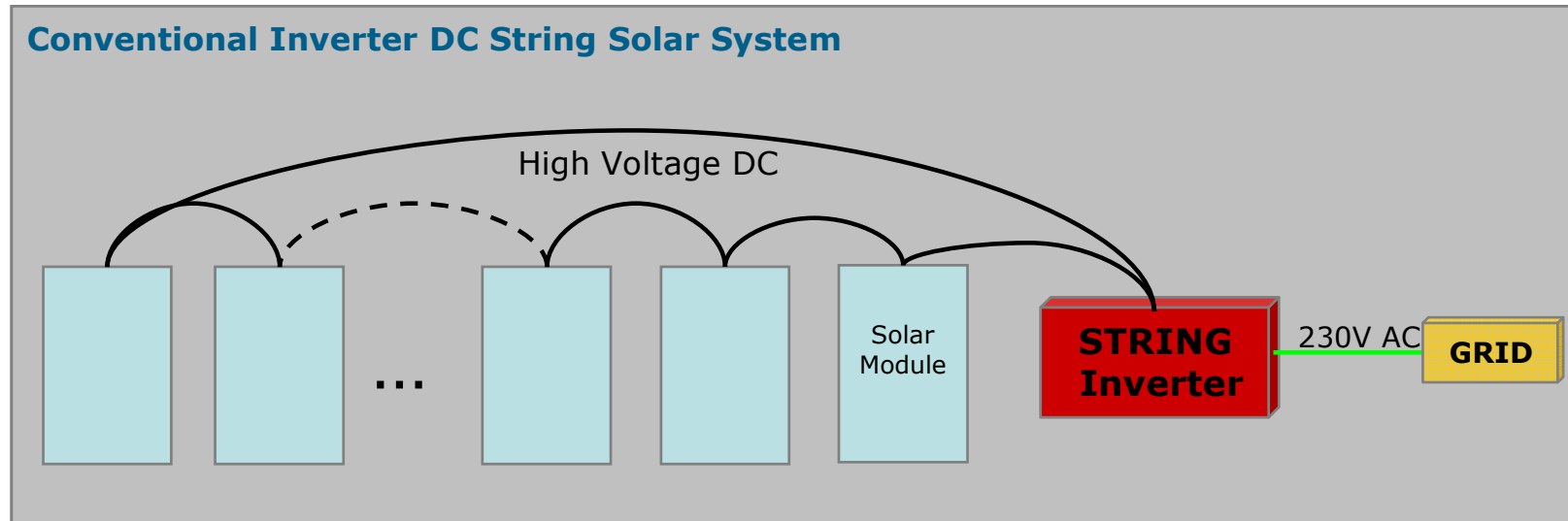


Source: PHOTON International, Solarbuzz, Enecsyst Ltd

- 2007 and 2008 brought in major over-demand followed by over-supply by the end of 2008
- Previously focusing on capacity expansion the market today is looking to provide lower cost & higher system performance
- Companies are transitioning from being component suppliers to integrated solutions providers



## Conventional Solar Grid Connect Systems



Conventional solar systems have:

- Modules attached in series strings
- One large string inverter
- High Voltage DC
- Visibility at system level only

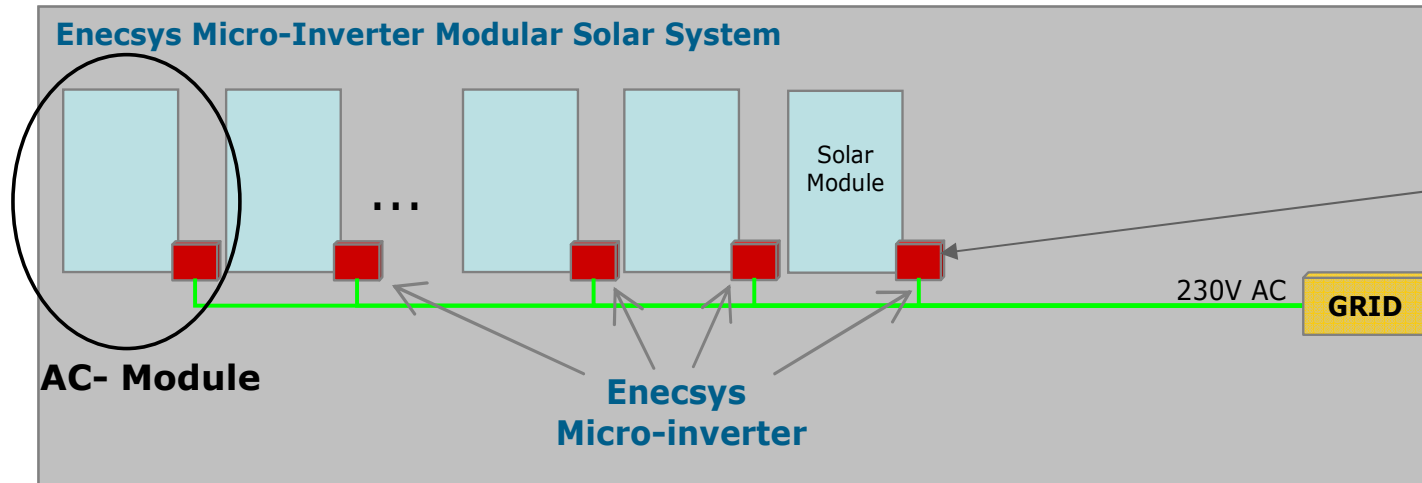
Focus of industry has been on:

- Inverter efficiency
- Low cost per Peak Watt

***Experience shows this to be a sub-optimal solution***



## Enecsys Provides a Simpler Solar System Architecture



**Enecsys** modular micro-inverter based solar systems have significant advantages vs. conventional DC string systems

1. Maximised harvested energy: shading & defect immunity, reduced cabling losses, and power optimisation (MPPT) for each module individually
2. No single point of failure
3. Safer system as high voltage DC is eliminated: simple, standardized, cost effective installation with no specialist DC installers
4. System management and performance enhanced through communication down to the individual module level



## Enecsysis Reduces the Total Cost of Solar Systems

### Conventional String Inverter System

### Enecsysis Enabled AC-Module System

**Total PV System Cost, per Wp**  
**\$6.7**

**15-20%  
reduction**

**Total PV System Cost, per Wp**  
**\$5.6**

Balance Systems  
Installation  
Integration  
\$2.9

Inverter  
\$0.75\*

Modules  
\$3

Simplified,  
Standardized, Lower  
Cost Installation

Balance Systems  
Installation  
Integration  
\$2

AC- Modules  
\$3.6

Module  
Manufacturers  
with Enecsysis  
**Increased  
Revenues &  
Profit**

Fully  
Integrated  
Solar  
Solutions  
Provider  
**Highest  
Revenues &  
Profit**

Module Manufacturers in  
Conventional String System

-Data for Typical Installations of 4kW

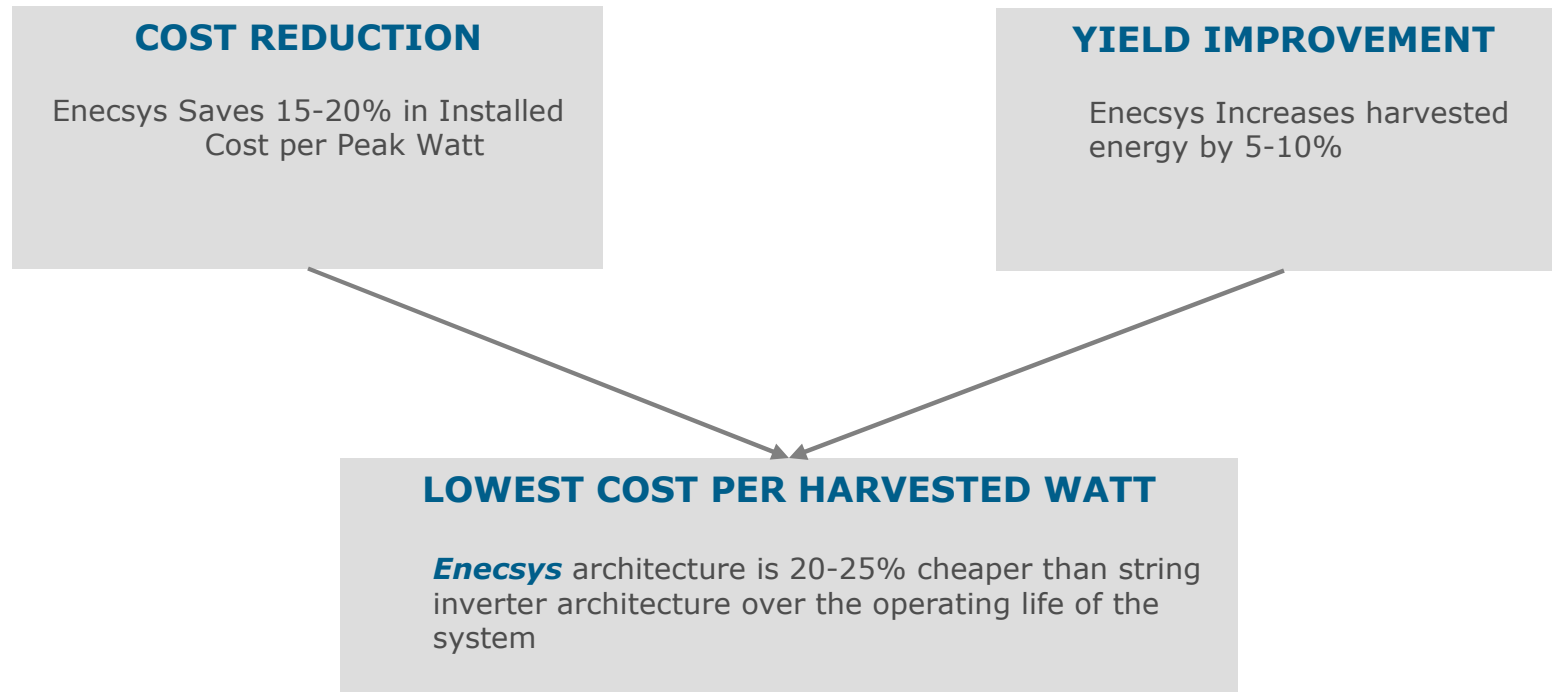
-Wp = Peak Watt

\* Includes cost of maintenance/replacement during system lifetime of 25 years

**Module Manufacturers selling AC Modules can improve revenues and profits while providing a 15-20% cost reduction in PV systems**



## Reduction in Cost per Yielded Watt – System Life Analysis



***Enecsys micro-inverters architecture is a MUST HAVE solution to lower the cost of solar, simplify deployment and increase market penetration***

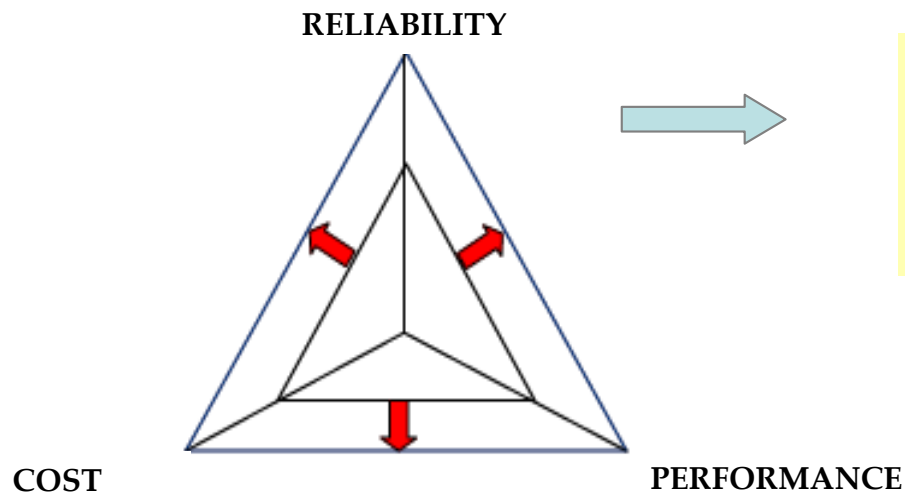




## Necessary features of Micro-inverters to successfully enable this market

In order to realise the benefits of the micro-inverter architecture it is necessary to optimise three interrelated qualities:

- **High Reliability:** long life to match that of the solar panel in an unprotected environment (25 years operating life)
- **Low Cost:** \$/W should be competitive with conventional string inverters and maintain profitability (2010 *target price of \$0.5/Watt*)
- **High Performance:** The system performance and hence harvested energy needs to be greater than that for conventional string inverters over an extended operating range



**Enecsys inverters uniquely deliver high performance at low cost and high reliability, yielding ~20% cost of ownership advantage**



## GB Patent 2434490: Energy Control

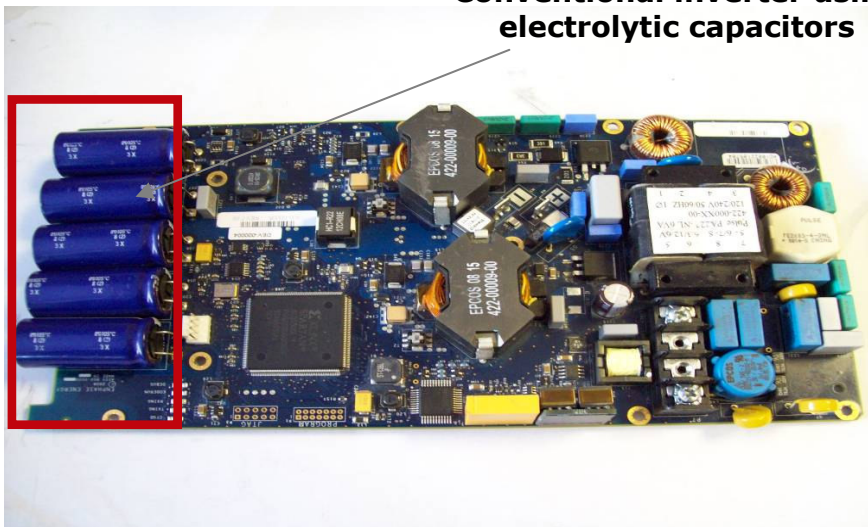
Purpose of the Energy control technique:

- Removal of low life time components
- Improved stability and maximum power point tracking

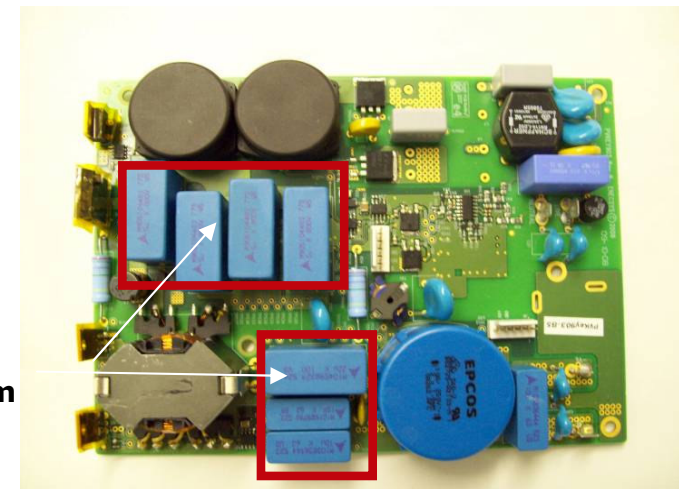
Unreliable components used in inverters include Electrolytic capacitors (and Opto-couplers)

- Panasonic TS-EB premium industrial electrolytic capacitor have an operating lifetime of 7,000hrs at 105°C. Epcos thin film capacitors have a lifetime of 30,000 hours at 105°C

**Conventional inverter using electrolytic capacitors**

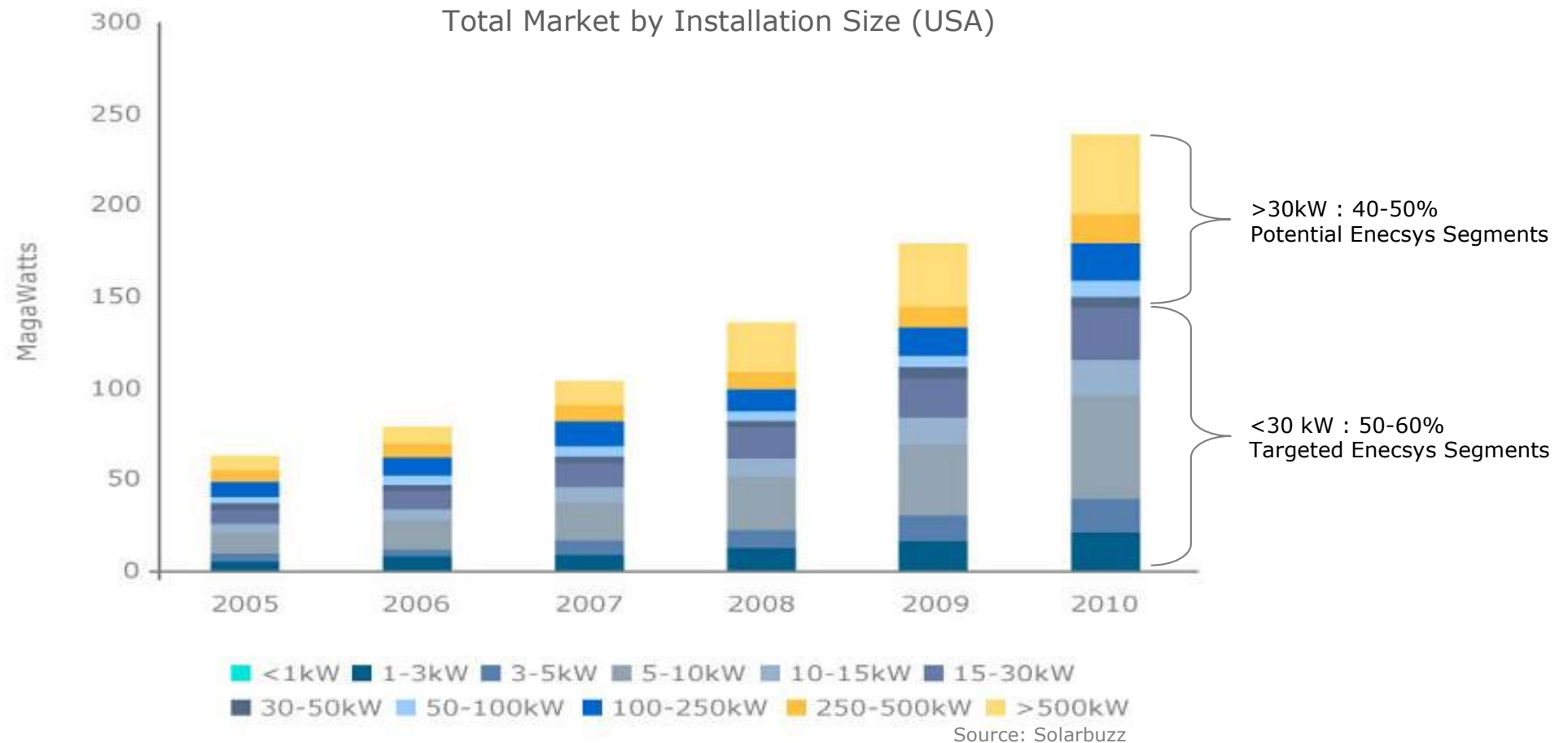


**Enecsys inverter using only thin film capacitors**





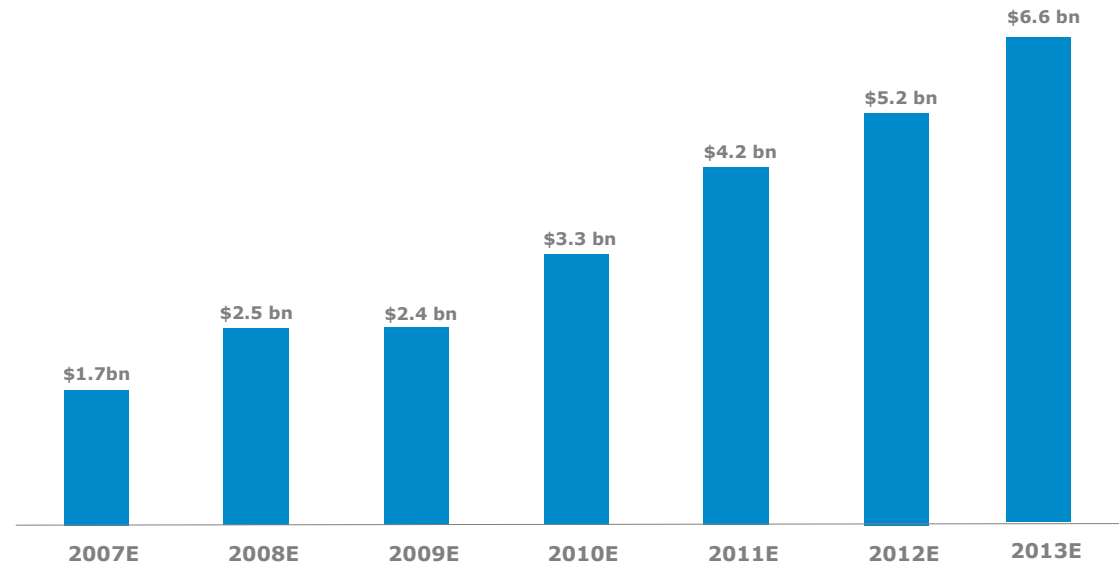
## Modular Inverter Target Segments



- Enecsys' primary target market are systems below 30kW which makes up 50-60% of the total market
- Enecsys' secondary target market are systems above 30kW which makes up 40-50% of the total market, including recently emerging power plants



### Total Market Size for Solar Inverters

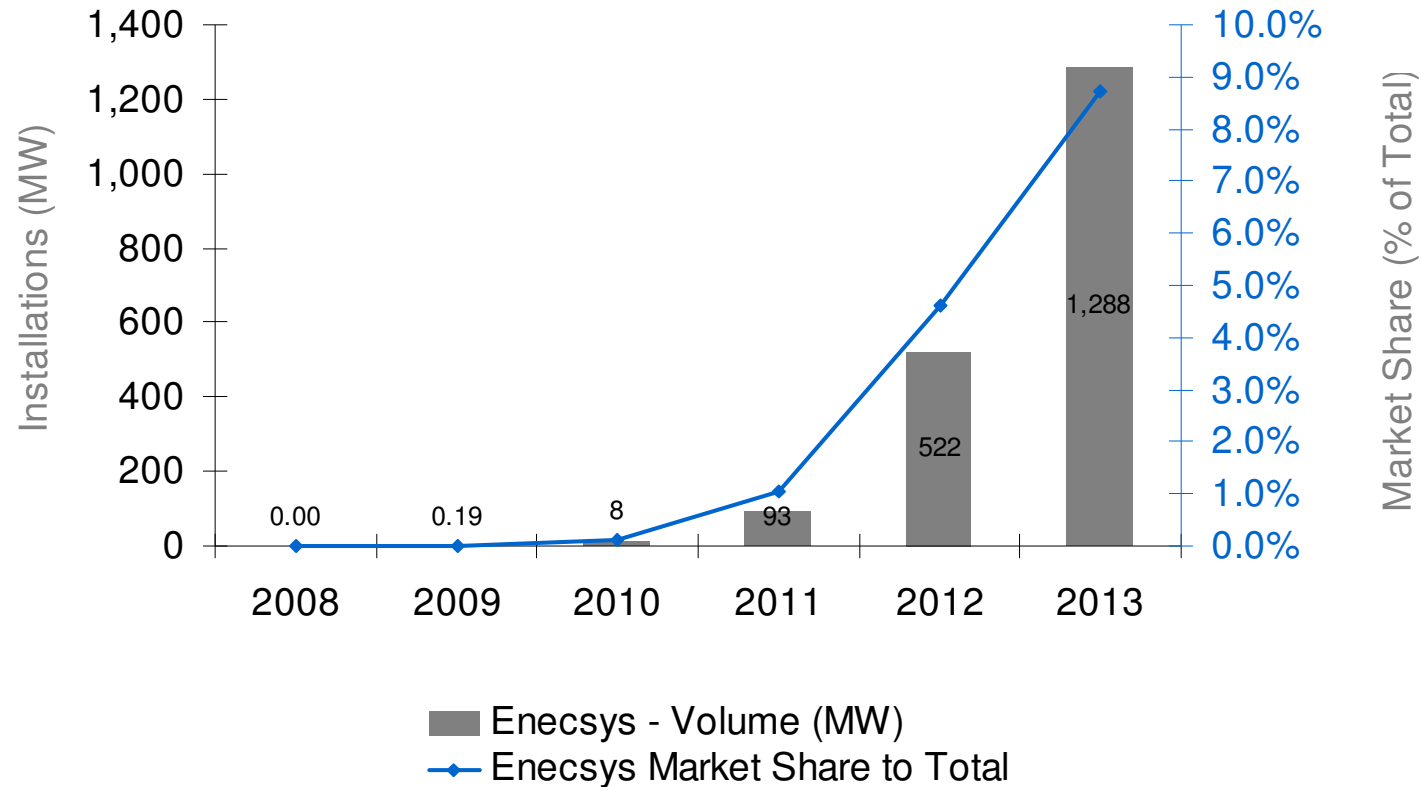


Source: PHOTON International, Solarbuzz, SMA Solar Technologies, Enecsys Ltd

- Estimated Solar Inverter market size in 2008 was \$2.5Bn
- The market for inverters is expected to grow at similar rate to that of PV systems, taking into account price reduction: conservative estimated CAGR of 21% from 2008-2013
- The market for inverters is expected to reach close to **US\$7 billion** by 2013



## Enecsys Inverters in the Market

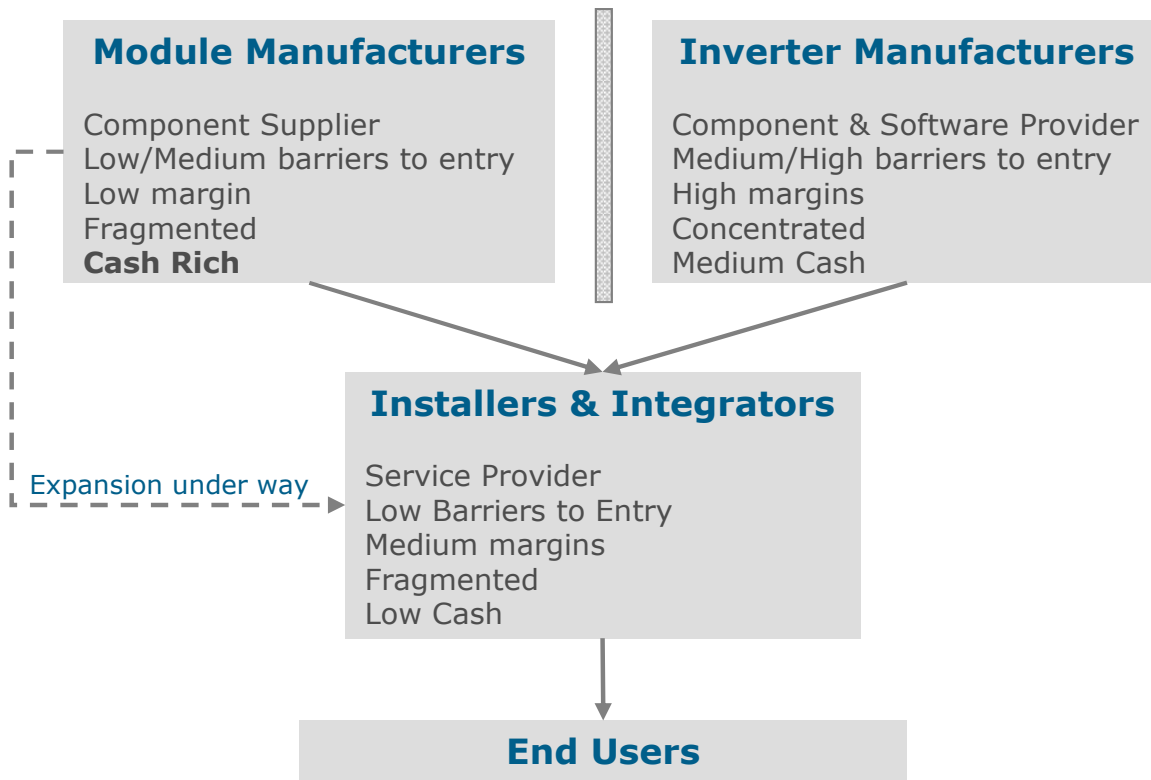


- Micro-inverters will represent 25% or more of the total inverter market by 2013
- Enecsys is assuming it can take at least 35% of the micro-inverter market share
- By 2013, Enecsys can achieve a market share of total inverters of around 9%
- Enecsys capacity sold would be approximately 1.3 GW by 2013

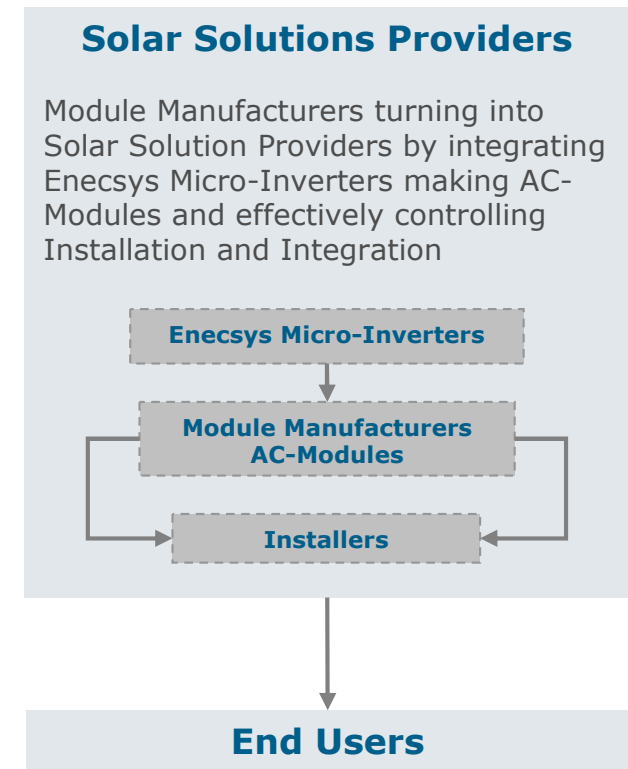


## Enecsys and the Consolidation of the Solar Value Chain

### Current Solar Value Chain



### Enecsys Enabled Solar Value Chain



***Enecsys simplifies the solar value chain by enabling module manufacturers to move from a component supplier to a solar solutions provider***



- Grid connect solar is a major growth industry (~\$40 billion in 2008) providing a valuable source of alternative energy but still only a tiny fraction of the world's energy needs.
- Feed-in tariffs, subsidies and financing are key drivers of solar growth until grid parity becomes widely evident in 2-5 years.
- After explosive growth in 2008, new solar installations will decrease in 2009 as Spain will decline dramatically and Germany will stay flat or decline. Other countries like France, Italy, Canada, China and the United States will likely grow strongly from a smaller base.
- Industry over-expansion is driving solar suppliers to aggressively lower prices as there is significant over-supply in the solar supply chain for the first time.
- Module manufacturers are driving to become solutions providers vs. commodity component suppliers to avoid being commoditised. **The integration of the inverter function with the solar modules is key to this vertical integration strategy.**
- The industry is becoming smarter as it shifts from:
  - 'lowest cost per *peak* watt with highest *theoretical* efficiency'
  - to: 'maximum **harvested** watts at lowest **lifetime** cost'.
- 'Plug and Play' AC modules will empower rooftops, residential to commercial, to be increasingly useful real estate for solar deployment as simplicity lowers installation cost.





**Enecsys is well placed as a key market enabler with disruptive technology to be a very successful participant in this dynamic solar market**