



Sunshine is our business.

Innovating photovoltaics: The way ahead..

Crystalline Silicon, Revolution or Evolution?

Milan, 07 May 2013



The devil is so often in the details..

HOW MUCH DO WE OWE TO THESE WOMEN?



In the 1920's, the USA did represent 65% of the world oil production

They (probably) helped to go from:
2,000,000 barrel / day in 1910
upto 90,000,000 in 2009

What about the invention of road asphalt?

What about the tyre repair centres?

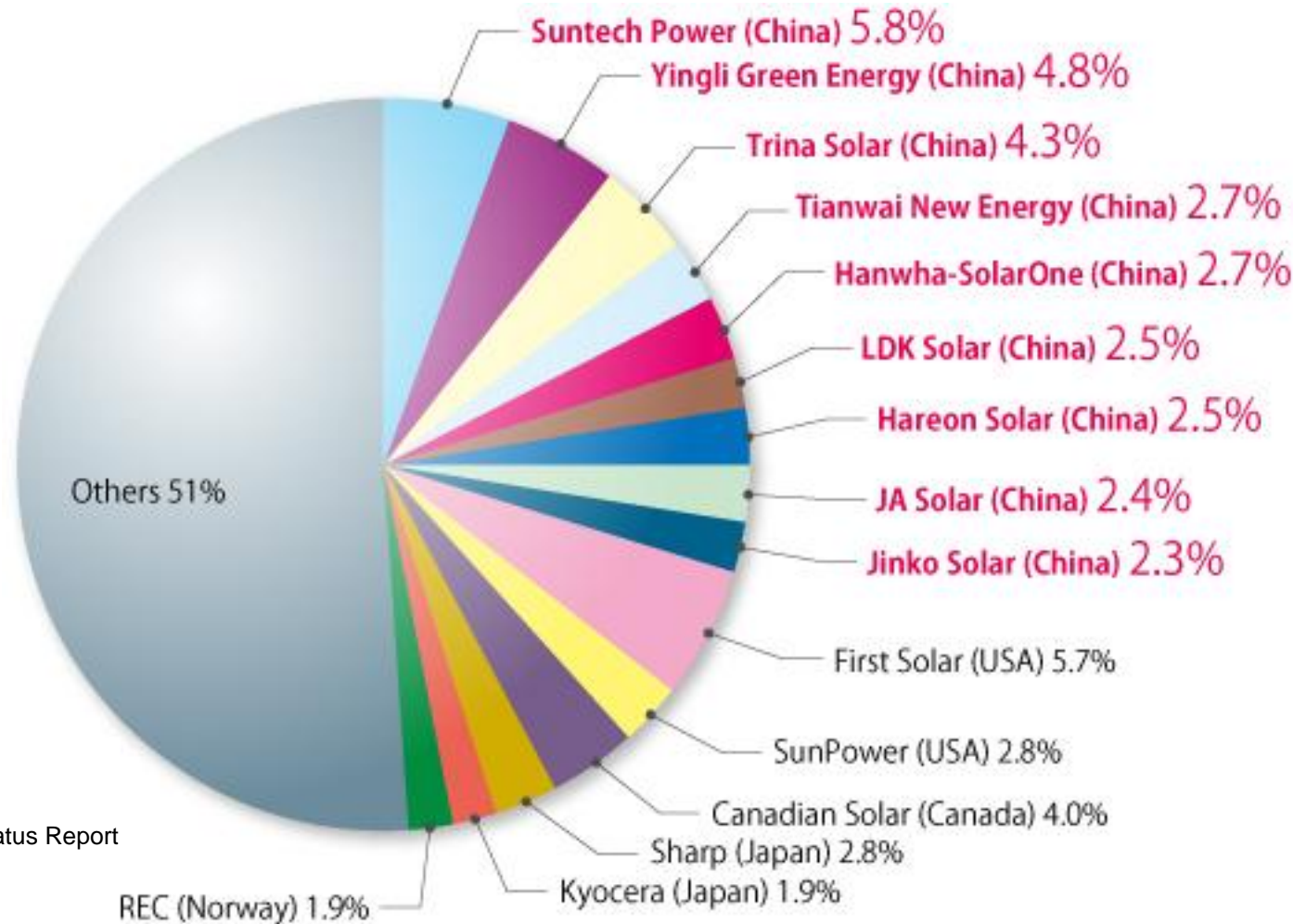
What's the value of such an invention (automobile) without the ecosystem around it?

Cells: have EU lost a race? Is China gaining anything?

CELL PRODUCTION SHIFTING RAPIDLY TO CHINA (TF & C-SI)



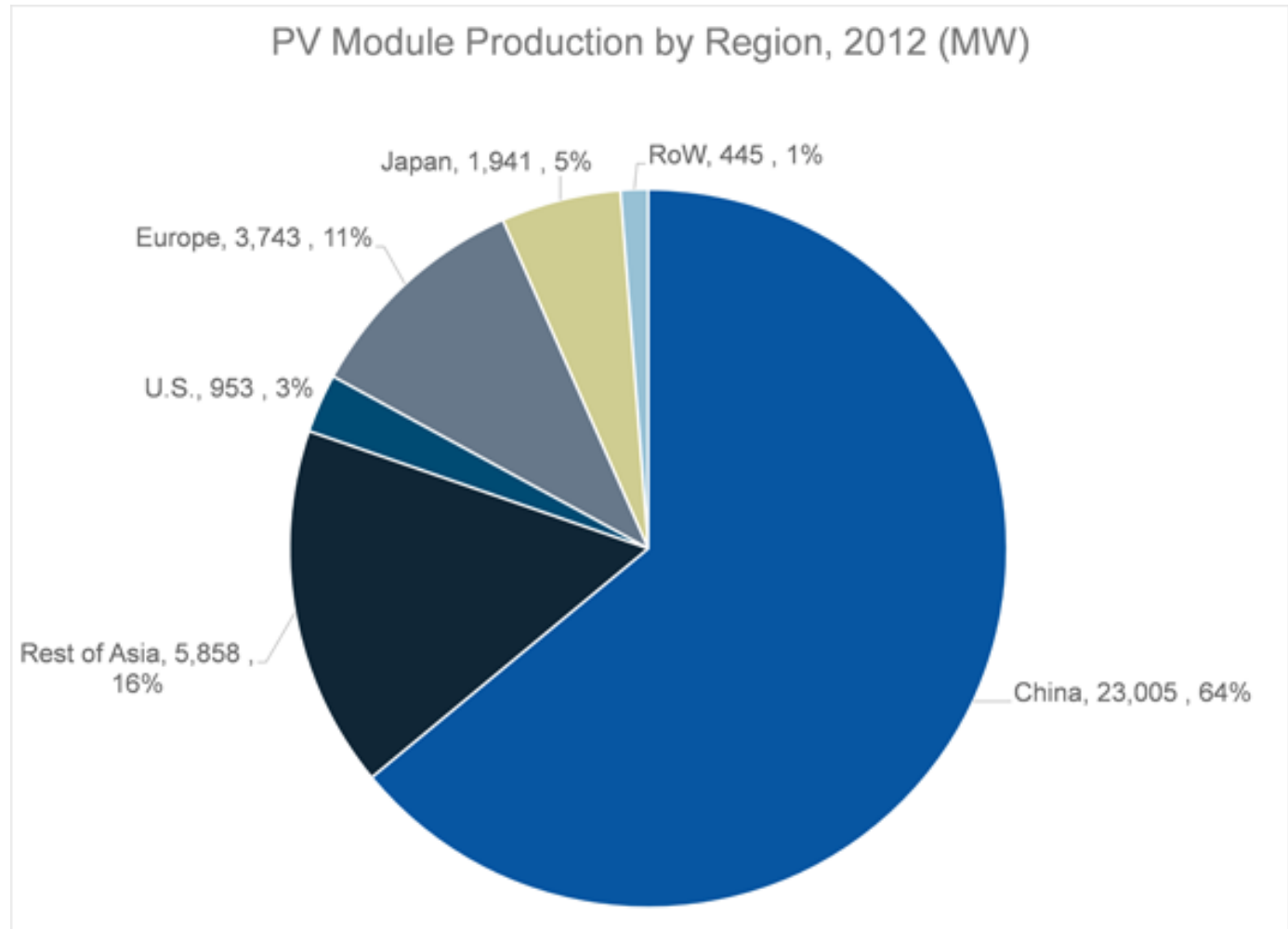
Market shares of solar cells manufacturing companies



Source: Renewables 2012 Global Status Report

Modules: have EU lost a race? Is China gaining anything?

WORLDWIDE MODULE PRODUCTION 2012 (TF & C-SI)



Source: greentechmedia, Shyam Mehta

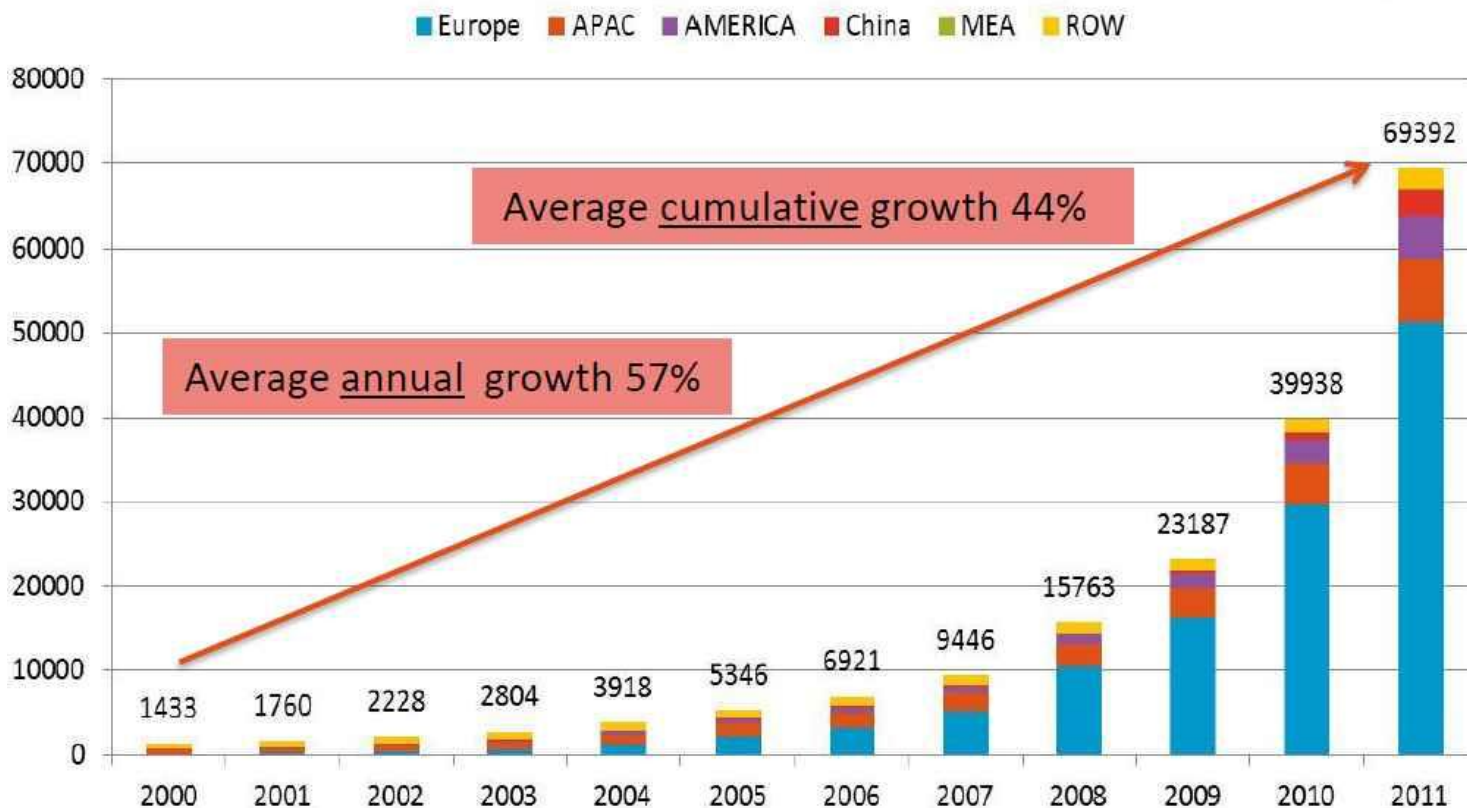
Worldwide production capacity increased aggressively

60GWP OF CAPACITY RESPONDS TO A DEMAND OF... 30GWP



Cumulative PV installed base reaches globally today >100GW

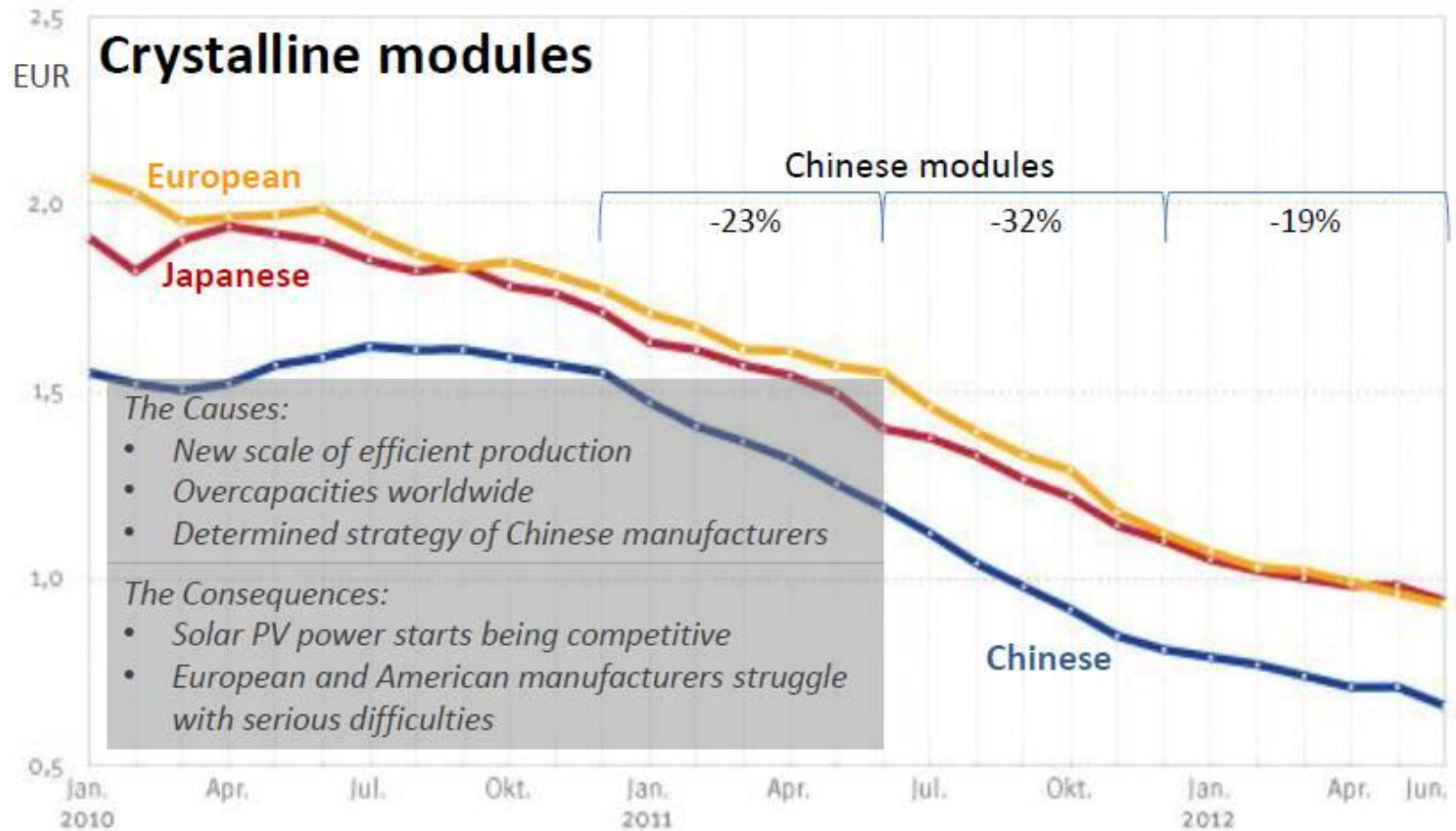
Evolution of Global Cumulative installed Capacity 2000 - 2011 (MW)



Source: EPIA

Which led to large scale erosion and possibly dumping..

PRICE DEVELOPMENT SHOWING CUT-THROAT COMPETITION



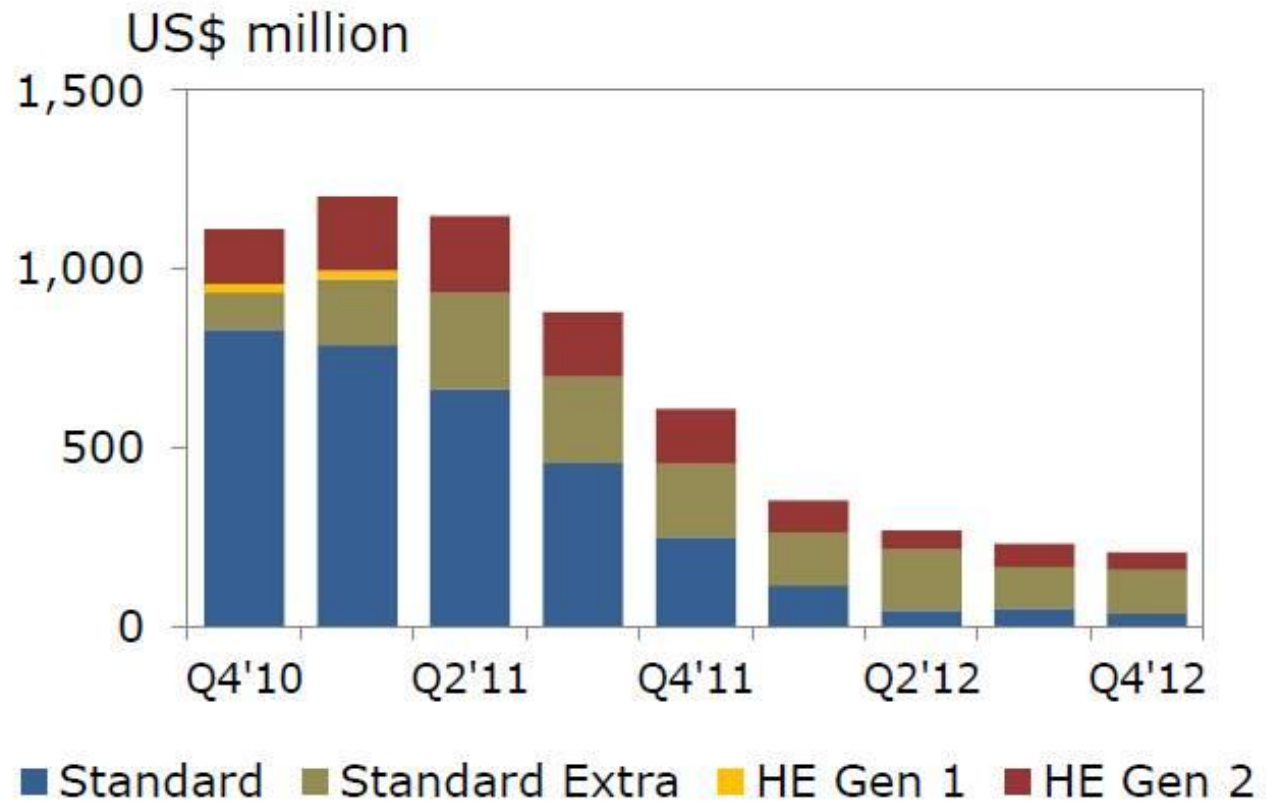
Source: Solar Buzz, Presentation Finlay Colville, PVSEC, Sept. 2012

R&D effect with eroding margin throughout the value chain

LOW INVESTMENT = SLOWER TECHNOLOGICAL EVOLUTION



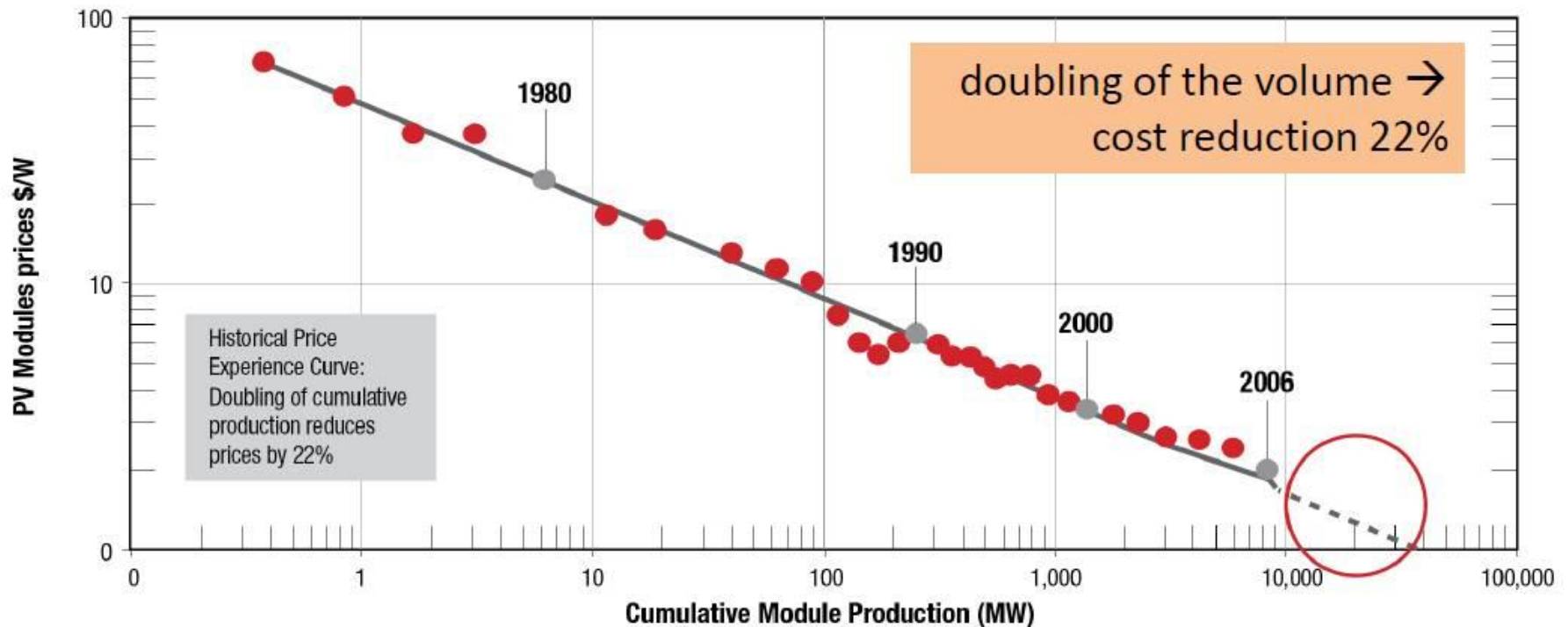
Equipment Spending on c-Si Cell Lines



Source: Solar Buzz, Presentation Finlay Colville, PVSEC, Sept. 2012

PV Learning curve predicts still further price reduction..

WHAT DO WE LEARN FROM THE PAST?



Sources: EU Joint Research Centre - EIA - National Renewable Energy Laboratory - A.T. Kearney analysis.

How to sail in stormy waters or are we in the doldrums?

EUROPEAN PV INDUSTRY IN TURMOIL

- SUMMARY -



- **Global PV industry** accumulated (and still does) massive losses
- **Insufficient investments** in new technologies slow down development
- **Chinese PV Industry** accumulated ~80,- b€ debt, still increasing

EU (German) feed-in policy, innovative PV industry and R&D have put PV on the map worldwide but an insolvency wave goes through Europe

- + **Grid parity** for consumers widely reached
- + **Strong enabler** for changeover to a renewable energy society
- + **Recent 'threat'** of EU import tax can help to stabilize PV market
- + **Shake-out** supports quality: huge opportunities for 'good' companies

Quality and service always pay off

CENTROSOLAR MAINTAINS FOCUS ON QUALITY & LONGEVITY



- Centrosolar keeps main focus on residential market; <30kWp
- Optimized module design for quick and easy installation
 - ✓ Labour part of BOS is paramount and efficiency can improve still
- Highest yield through anti-reflective coated glass
- Longest product warranties of up to 15 years
- Longest linear power warranties of up to 30 years
- Highest production standards to insure longevity and constant quality
- Conformity with Quality, Environmental, Health and Safety Regulations:
 - ✓ DIN EN ISO 9001
 - ✓ DIN EN ISO 14001
 - ✓ OHSAS 18001
- Elegant optics for both in-roof and on-roof installations

Baseline: “Professional” - 60 cells high power, high value -

GLASS-FOIL DESIGN: 60 CELLS, STRONG ALUMINUM FRAME



- Standard design, excellent value for money
- Current power classes up to 255Wp
- High quality standard, all certificates

- Benefit from cell supplier’s efficiency roadmap

- Ongoing technological evolution to improve module efficiency and reduce cost:
 - ✓ PID resistant cells, PID suppressing encapsulate
 - ✓ Ag-free ribbon material
 - ✓ Optimal light-coupling through AR solar glass
 - ✓ In-house testing to TÜV standards of all components
 - ✓ Low-”CO2-footprint” frame using recycled Aluminum
 - ✓ Optimized in-house frame design for maximum strength

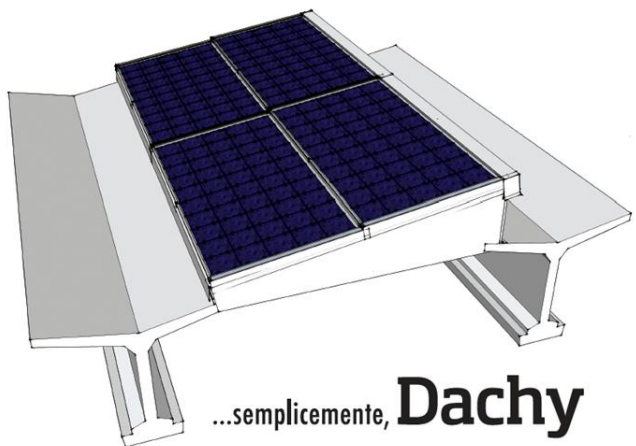


In-roof only: Solrif based

INTEGRATION DELUXE – RESIDENTIAL & INDUSTRIAL



20% Market share achieved in Italy in 2012..

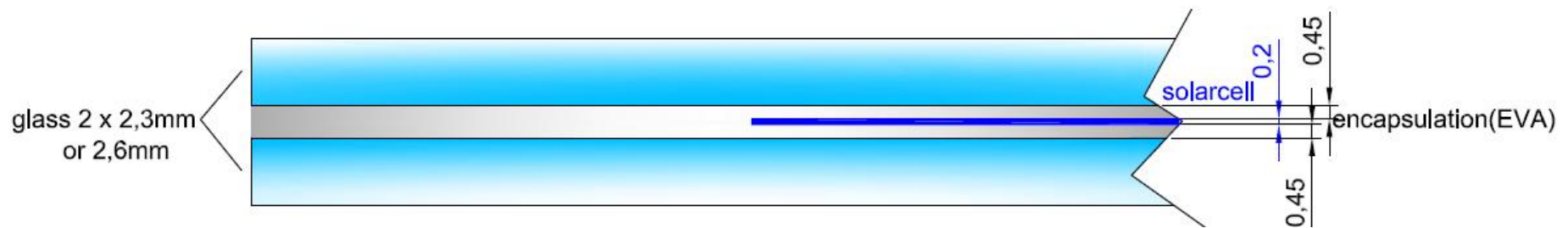


...semplicemente, **Dachy**



High-End: "Vision" - 54 & 60 cells frameless Glass Glass -

ESTHETIC BARRIER-FREE INROOF & ONROOF INSTALLATION



High-End: “Vision” - 54 & 60 cells 2mm frame Glass Glass -

EXTREMELY STRONG BUT LIGHTWEIGHT, LONG-LIVED



- Lightweight due to **2mm thin glass**
- Extremely strong sandwich concept
- Very long lifespan due to excellent moisture barrier

- **No power degradation** under mechanical load since the cells are in neutral tension phase

- Product warranty: 15 Years
- Linear power warranty: 30 Years

- Easy handling and mounting
- Beautiful esthetics



...NEW....

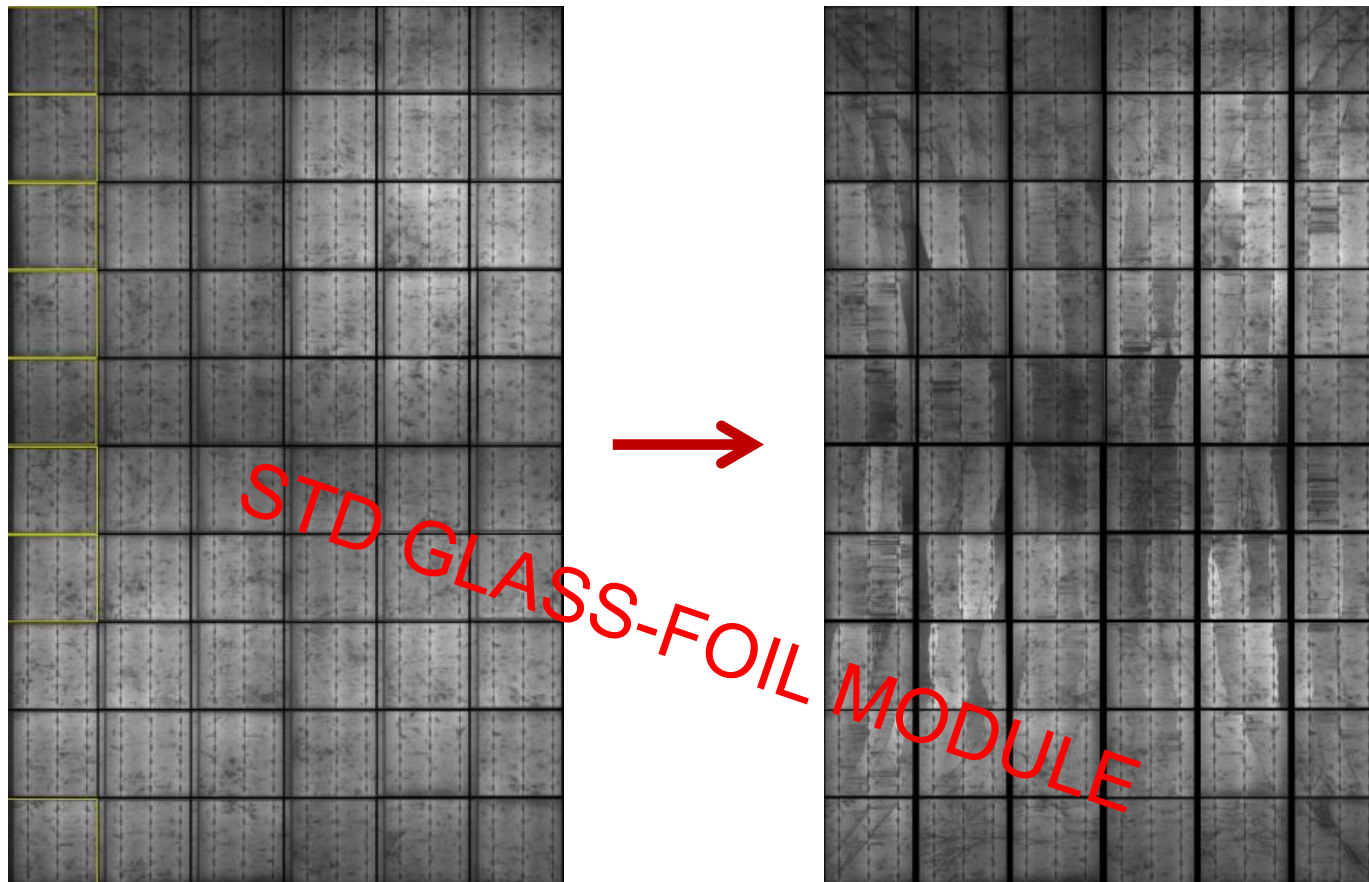
Double Glass for esthetics, power and longevity

STRONG SANDWICH CONCEPT, BEST PROTECTION FOR CELLS



Glass Foil: Electroluminescence image after 5400 Pa Mechanical load test

$$\Delta P = -4,67\%$$



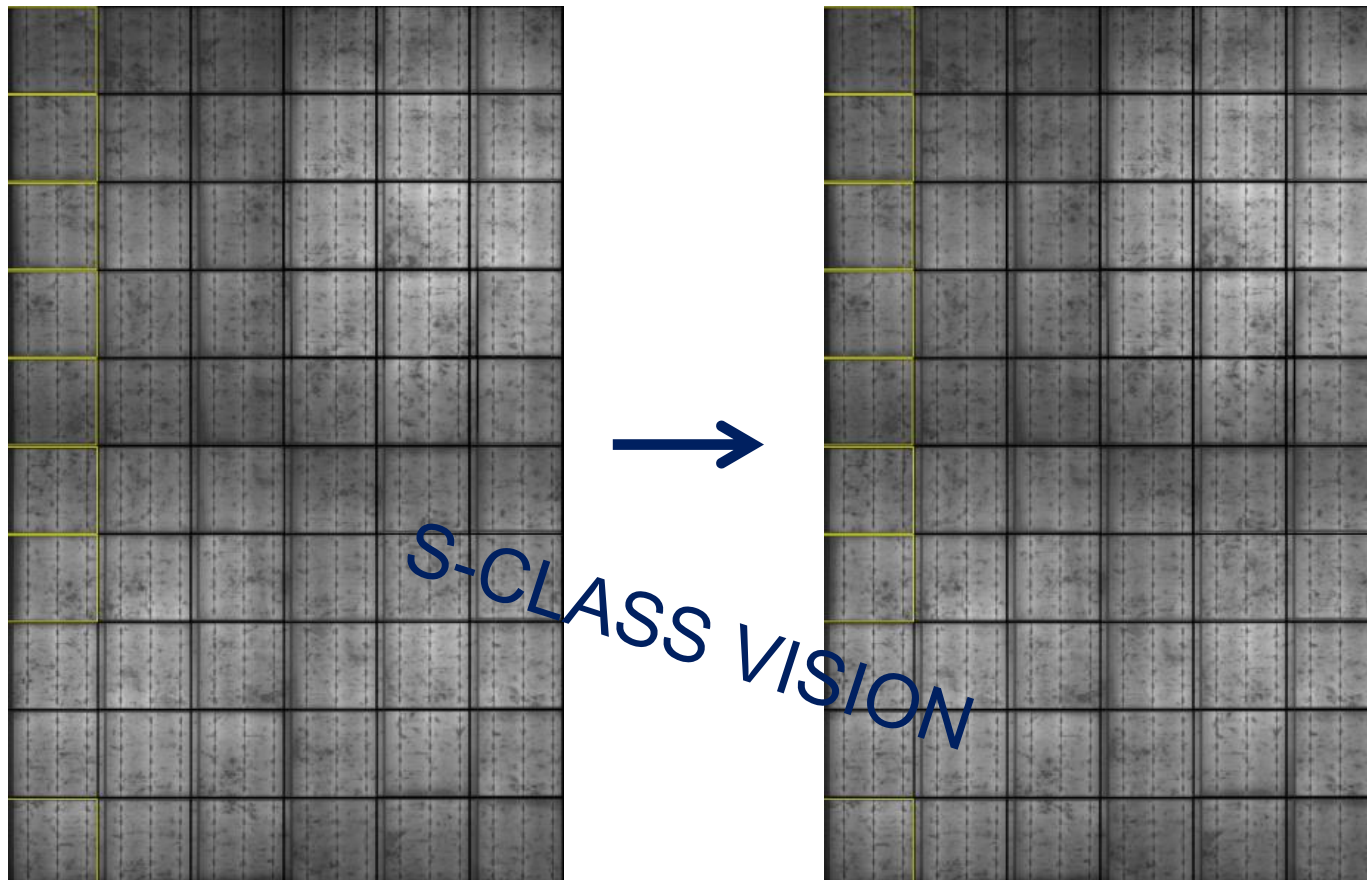
Double Glass for esthetics, power and longevity

STRONG SANDWICH CONCEPT, BEST PROTECTION FOR CELLS



Glass Glass: Electroluminescence image after 5400 Pa Mechanical load test

$\Delta P = 0\%$



Centrosolar as a Leading Module Manufacturer

PART OF THE EVOLUTION, NECESSARY FOR THE REVOLUTION



- Evolution through continuously increasing cell power
- Optimal benefit from Cell manufacturer's roadmap
- Cell efficiencies up to 18% Poly and 20% Mono

- Added advantage of high-end module design
- Revolution through new module and mounting concepts

- Longlife double-glass modules
- Ready for next-generation high-efficiency cells: N-type based, Bifacial, Heterojunction..
- State of the art module production for low cost and constant quality

- In-house evaluation of products and components to IEC/TÜV standards

How difficult is it to change?

FROM A FIRE DRAGON IN 2012 TO A WATER SNAKE EARLY 2013..



How does Centrosolar Italia intend to play in 2013?

TOWARDS FLUIDITY...



- Anchored lived company values
 - Merit
 - Responsibility
 - The search of the solution

How does Centrosolar Italia intend to play in 2013?

TOWARDS FLUIDITY COLD BLOODED...



- Anchored lived company values
 - Merit
 - Responsibility
 - The search of the solution

- The will to create value
 - Solution Provider
 - Blue Ocean Strategy (Redefine the rules of the game)
 - Horizontal Integration (Services & products)
 - Ecosystem (Margin share & Risk share)

How does Centrosolar Italia intend to play in 2013?

TOWARDS FLUIDITY COLD BLOODED WITH RYTHM...



- Anchored lived company values
 - Merit
 - Responsibility
 - The search of the solution



- The will to create value
 - Solution Provider
 - Blue Ocean Strategy
 - Horizontal Integration
 - Ecosystem

(Redefine the rules of the game)
(Services & products)
(Margin share & Risk share)

- Means
 - Timing, maturity, observation...

(At the level of our ambitions)

PV RESULTS: WORLD (100 -> 135GWp 2013), EU, ITALY



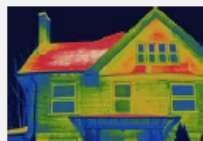
- At the end of 2011, Italy did reach some 13GWp cumul. installed base (9GWp in 2011 only), Germany did reach that same year 25GWp
- China did close 2012 with some <4GWp installed, the U.S. with some <4GWp, Japan with 2.5GWp
- **Germany did close last 2012 with >32GWp cumul. installed (Sept'12 was showing already an installed >6GWp)**
 - 1Q'13 shows >1GWp installed PV
- **Italy did close last 2012 with 16.2GWp cumul. installed (GSE), 3.2GWp in 2012**
 - 1Q'13 with >300MWp installed PV

	Totale cumulativo		Tot. 2012		Tot. 2011	
	MWp		MWp		MWp	
<3kWp	421	2.6%	118	3.7%	137	1.4%
<20kWp	2069	12.8%	634	19.7%	805	8.5%
<200kWp	3417	21.2%	937	29.1%	1776	18.8%
<1000kWp	6811	42.2%	1314	40.8%	4266	45.1%
<5000kWp	2005	12.4%	118	3.7%	1513	16.0%
>5000kWp	1415	8.8%	103	3.2%	958	10.1%
	16138		3224		9455	

- 1 Competitività:** Ridurre significativamente il gap di costo dell'energia per i consumatori e le imprese, con un graduale allineamento ai prezzi europei
- 2 Ambiente:** Superare gli obiettivi ambientali definiti dal 'Pacchetto 20-20-20' e assumere un ruolo guida nella 'Roadmap 2050' di decarbonizzazione europea
- 3 Sicurezza:** Rafforzare la nostra sicurezza di approvvigionamento, soprattutto nel settore gas, e ridurre la dipendenza dall'estero
- 4 Crescita:** Favorire la crescita economica sostenibile attraverso lo sviluppo del settore energetico

The market and the political framework

STRATEGIA ENERGETICA NAZIONALE (SEN) – 7 PRIORITIES



1 Efficienza energetica



2 Sviluppo **mercato competitivo** e **Hub del gas** sud-europeo



3 Sviluppo sostenibile delle **energie rinnovabili**



4 Sviluppo dell'**infrastruttura** e del **mercato elettrico**



5 Ristrutturazione della **raffinazione** e della rete di **distribuzione** dei carburanti



6 Produzione sostenibile di **idrocarburi nazionali**



7 Modernizzazione del sistema di **governance**

Source: SEN March'13

The market and the political framework

EREC (EPIA) & STRATEGIA ENERGETICA NAZIONALE – 2030 –



Providing a clear signal for investors

Decrease the costs of uncertainty while facilitating the achievement of the existing 2020 targets

Growing the economy

The 2020 energy and climate framework has made the renewable energy sector one of the most recession-resistant areas of European economy

Reducing the costs of decarbonisation

Reducing the costs of financing

Investments have become difficult due to the uncertainty about the mid/ long-term policy perspectives

Reducing the need for support mechanisms

Move into a fair and properly functioning energy market for electricity, heating & cooling and transport.

Enhancing EU technology leadership

Ensure that the EU is fully equipped for this competition, even in times of austerity

Replacing fossil fuel imports

In 2011, the EU 's combined trade deficit was €150 billion. At the same time the net import bill for fossil fuels to the EU amounted to €388 billion, more than 3% of EU GDP

Creating jobs

The EU renewables sector directly and indirectly employs around 1.2 million People

Protecting the environment

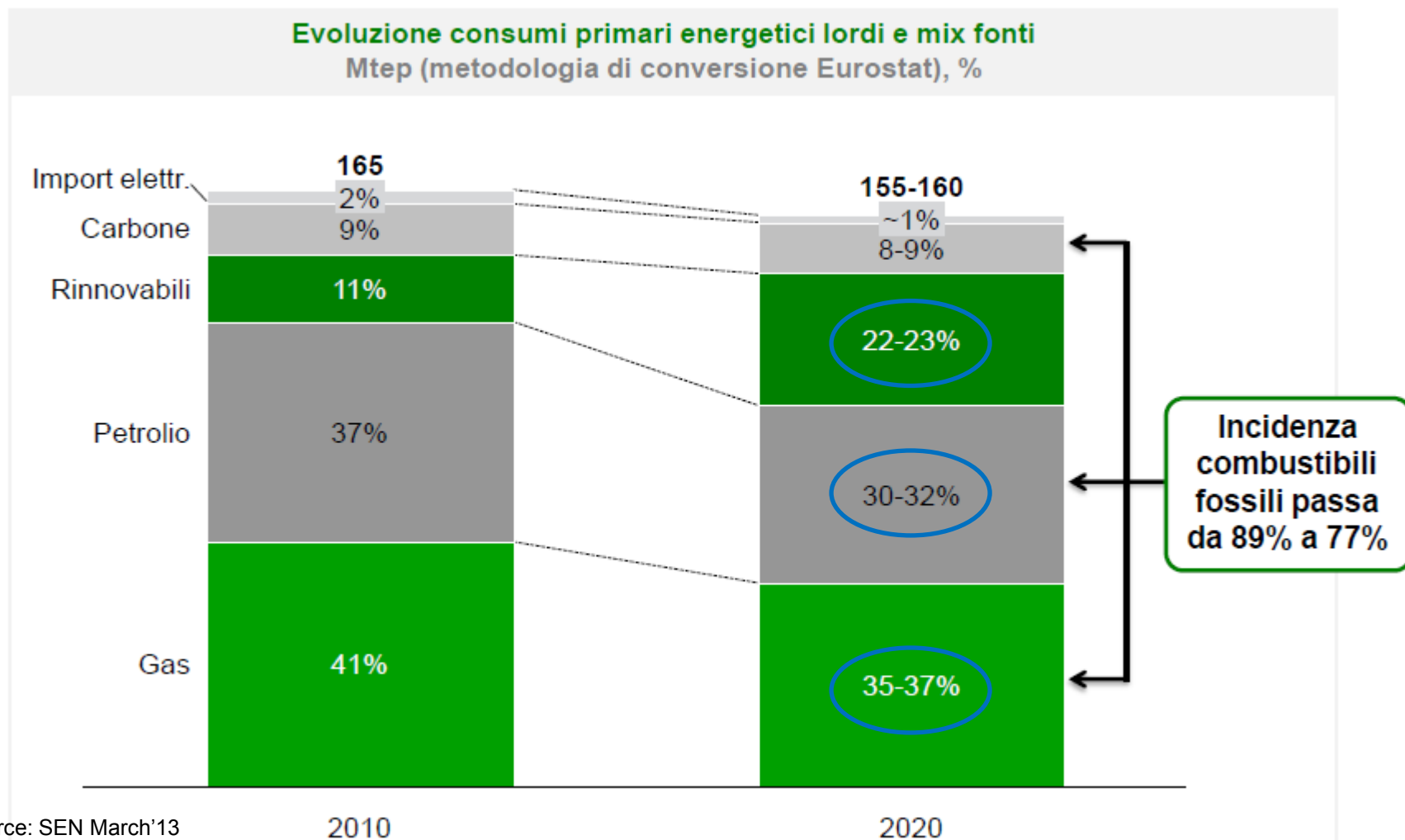
Not just about emissions but about water consumption, thermal pollution, waste and impacts on soil

Diversifying technology

Different technical options, which can be used across the three energy sectors

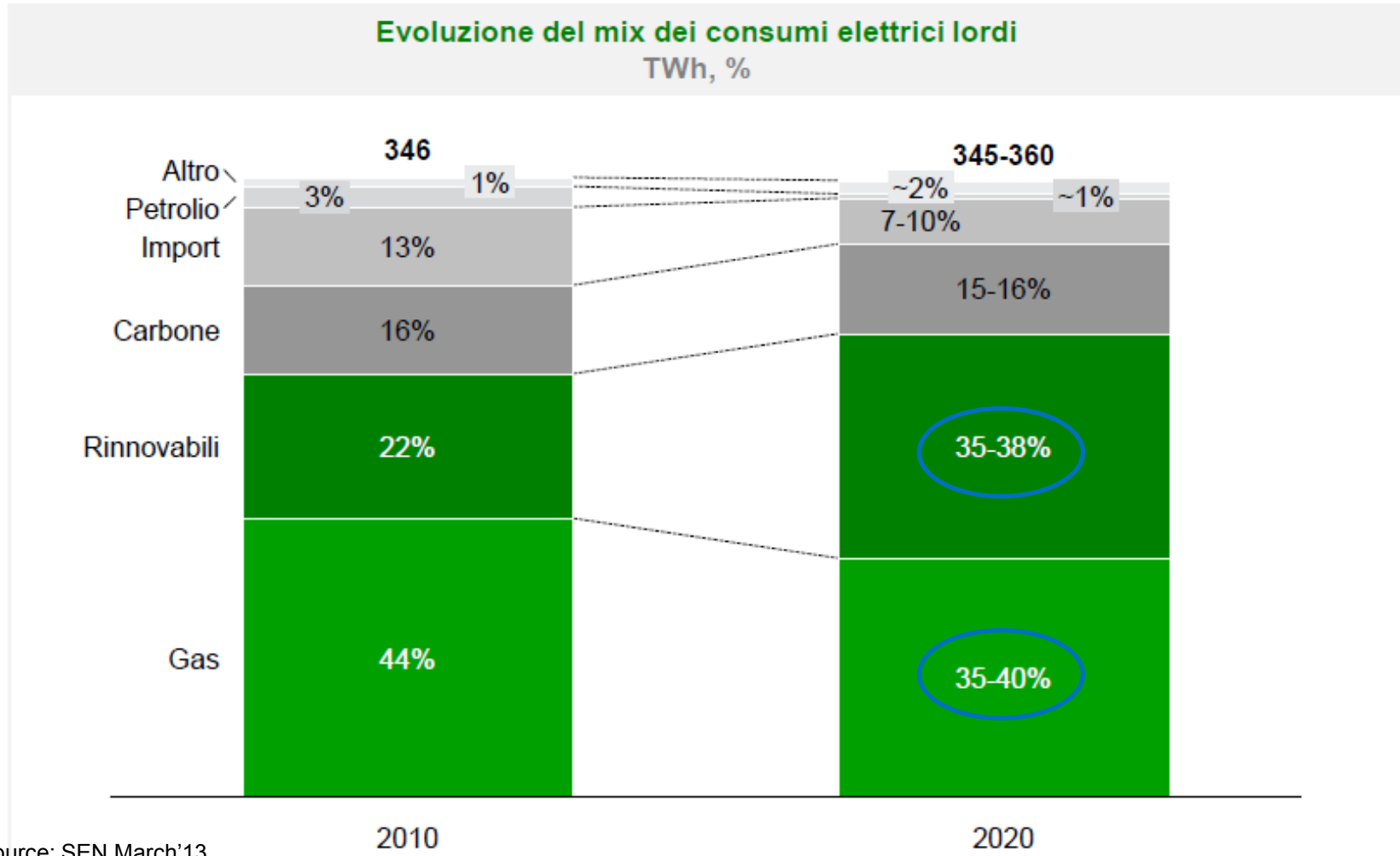
The market and the political framework

SEN – ENERGY EFFICIENCY (- 10 MTEP IN 10YEARS)



The market and the political framework

SEN – MIX BETWEEN GAS & RENEWABLES (>100TWH FROM RES)



The political framework and its opportunities

IN ITALY – INTERNET-LIKE ELECTRICAL ENERGY



- **Efficient System of Utilization – Sistemi Efficienti di Utenza (SEU)**
 - Allow for green electrical energy sales in loco to anyone, without levying any costs for the infrastructure (transport, network, distribution)
 - Fundamental part in the «ladies in white» approach: meeting the infrastructure and device harmonisation
 - It supports the no-FIT trend, needs some legal and political framework
 - The offer to any given end-user could be done through a PPA (Power Purchase Agreement) and any given producer would sell its surplus without the extra of the traditional transport / dispatch costs

- **Internal Network of Utilization – Reti Interne di Utenza (RIU)**
 - This is the set of producers and consumers relying on a private network which can access a traditional public network
 - Some open questions: at which level should the cost of the public infrastructure be charged (transport, distribution, general)?
 - Should those costs be calculated based on the volume (kWh)? Any premium for planned consumption (kWh at 14:00 today)?

- **RIU are part of Closed Distribution System (Sistemi di Distribuzione Chiusi), while the SEU is a subset of Energy Self Supply System (Sistemi di Auto Approvvigionamento Energetico)**



The political framework and its opportunities

IN EU – DISCONTINUITY, NEW CONCEPTS



- Registration of the Asian modules (non EU) from early March 2013
- Antidumping? Decision by 31.12.13? Retroactive effects to March 2013?
- Recycling of PV modules & PV components applied in Italy from July 2012

- Incentive for batteries (self consumption) in Germany from 01.05.13
- In the rest of EU?

- Net metering (SSP - Scambio Sul Posto): possible to produce and consume in different time frames/ moment of the day/ day of the month (fee to agree upon for the transport and infra, fly-wheel effect, central storage, programmability & premium,..)

3kWp in Northern Italy for a TCO= 7300,-€ all inclusive..

Gives access to 73.000 kWh for the next 25years..

Production cost of the kWh PV= 0.10- €/ kWh

In the role of the Solution Provider, the Syst. Integrator

RADAR SCREEN



Focus on Efficiency (kWh, BTU, Energy Classes)

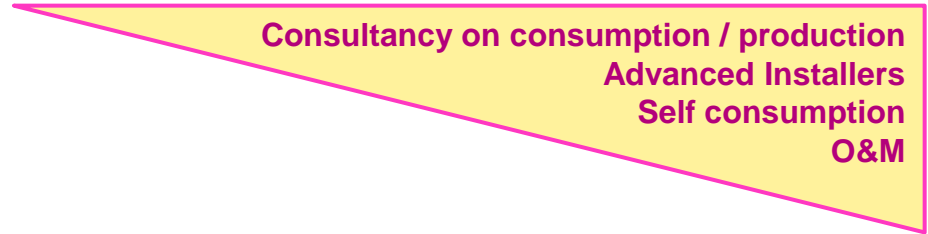
Focus on self consumption (kWh not purchased)



Time & road to end customers

Technical Expertise

Ecosystem



Ecosystem

Technical Support CS IT in order to manage:

- Geografical Contingencies
- Availability of the resources

Technical Support CS IT in order to manage:

- Geografical Contingencies
- Availability of the resources
- Interfaces & partners management
- Consultancy for the Indust. process optimization
- Grid connection to the Medium Voltage
- Procurement outside Wismar..

Centrosolar, 100% Made in Germany production

350MWP C-SI CAPACITY IN WISMAR, NEAR LUBECK

