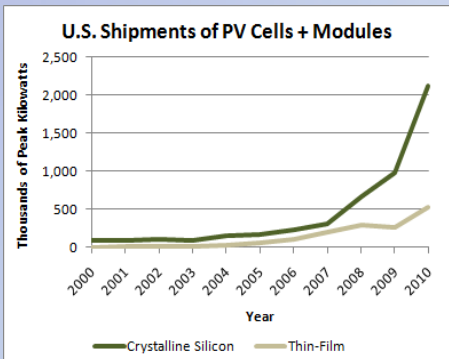


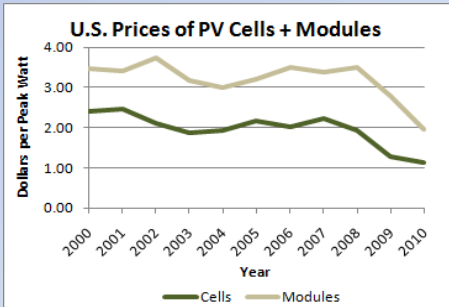
Solar PV Energy Overview

- Photovoltaics (PV) is a method of generating electricity by transferring solar radiation/energy to the flow of electrons in solar cells/modules/panels
- With the increased demand for renewable energy resources, PV use and development has advanced considerably in the last fifteen years
- As of 2013, PV remains the third most important renewable energy source in terms of globally installed capacity (after hydro and wind power)
- PV covers 3% of Europe's electricity demand, and 6% of its peak electricity demand
- Germany is the world's leading PV market, while China and Japan are currently the fastest-growing

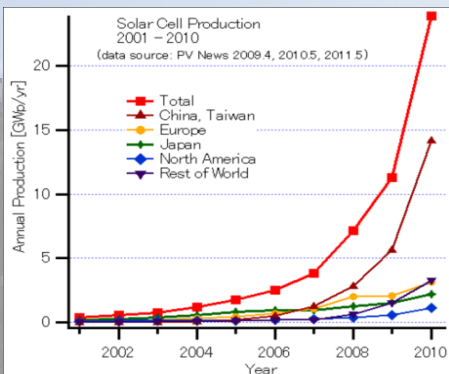
Trends Over Time (2000 – 2010)



- 3 main types of PV cells:
 - 1) monocrystalline silicon
 - 2) polycrystalline silicon
 - 3) amorphous silicon (thin-film)
- Crystalline silicon modules are more efficient (but more costly) than thin-film modules
- As production and maintenance costs steadily decline, more crystalline silicon cells are being made



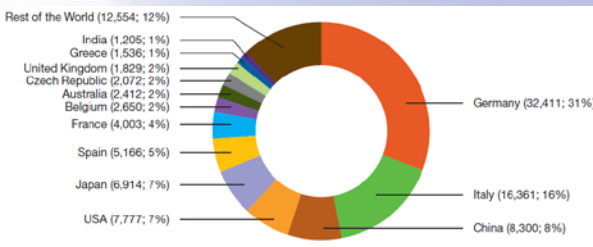
- Prices are steadily declining towards prices of traditional natural gas and coal electricity prices
- By 2020, PV is expected to be cost-competitive retail electricity prices
- This is a helpful indicator in the significant increase of added PV capacities around the world



- Though Europe dominates the PV market, China and other APAC countries produce 70% of the global PV demand
- China was also 2nd in new PV installation systems in 2012, behind Germany

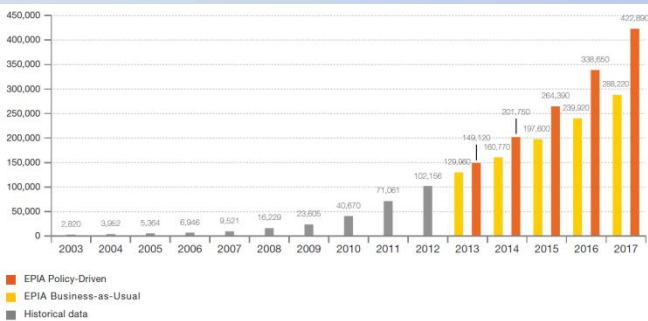
2012 Market/Production Shares & Forecasts

2012 Global PV Installed Capacity Share (MW; %)



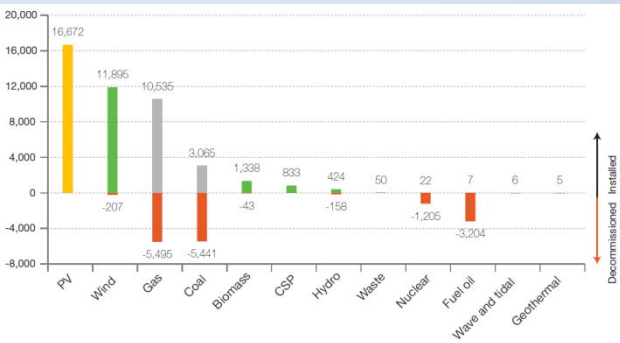
- Europe dominates the PV market, but the rest of the globe has room for potential
- Europe 2011: 74% of global market share
- Europe 2012: 55% of global market share
- Potential for less developed PV markets to expand considerably over the next several years
- China, India, Australia, Mexico, Singapore, South Africa, and others

Global PV Historical Data and Forecast (MW)



- The global market remains a **policy-driven** business
- Political decisions influence considerably the potential market take-off

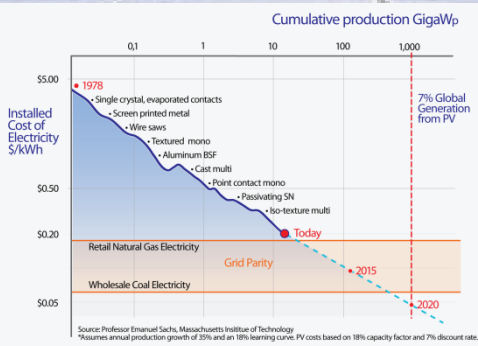
2012 Added Generation Capacities by Energy Sector (MW)



- PV in 2012 = #1 electricity source in the EU in terms of added installed capacity
- 2nd year in a row, and 2nd time in history
- PV has potential to play a much more major role as a global electric source
- Of PV categories, rooftop applications double utility-scale plants in terms of power
- Utility-scale plants are expected to grow much faster
- Utility-scale plants may pass rooftop applications in power generated by 2020

Cost-Competitiveness

- Over the last 20 years, the price of PV modules has decreased by over 20% every time the cumulative sold volume of PV modules has doubled (learning factor)
- Generation costs could decrease by up to 50% by 2020
- PV system prices decreased by 50% in the last 5 years
- A continuation of the recent increase in traditional gas and coal electricity prices could accelerate PV's competitiveness
- An expected sustainable market growth should see PV heavily competing in the energy sector within the next 5-10 years



Outlook – Key Factors

- Policy:** smart and sustainable political decisions must be made in order to allow PV markets to continue to grow
- Competitiveness:** PV is rapidly becoming competitive in terms of LCOE
- However, grid and market integration challenges will increase hamper future PV development
- Global expansion:** the potential for growth in non-European markets is great, and will become increasingly significant as these markets continue to develop
- Overall, as a renewable energy source with huge potential and environmental benefits, solar PV will become a major source of energy over time; at the very least, it will continue to serve as a reliable energy source

Solar PV Energy Overview

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Outlook – Key Factors

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