Crisis, what crisis?
Global Market outlook for Photovoltaics

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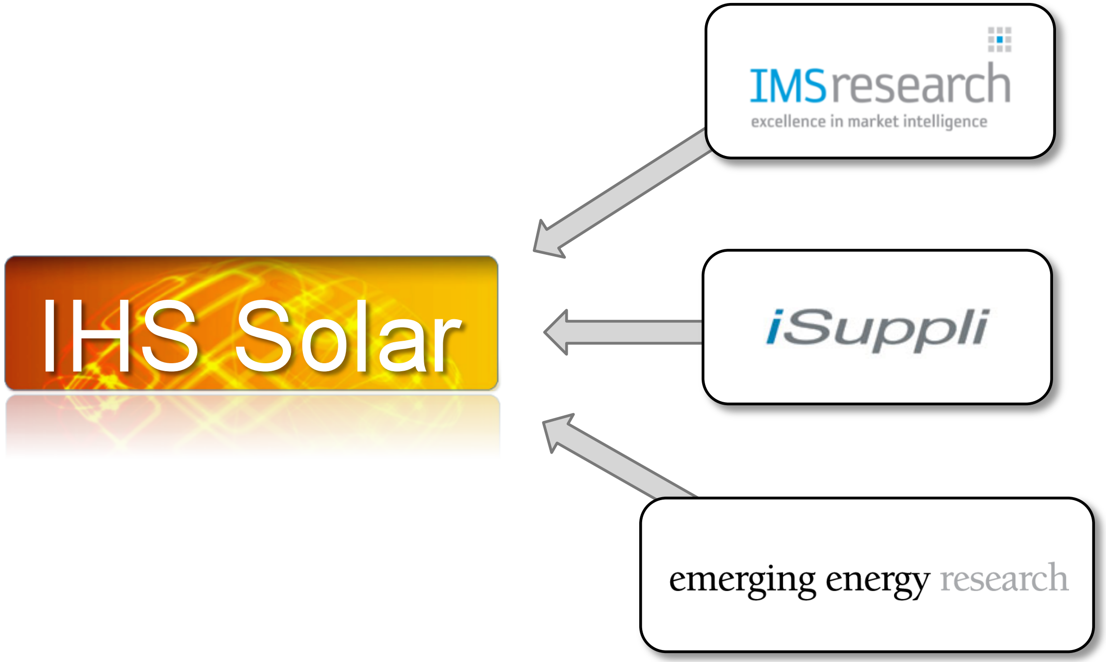
About IHS



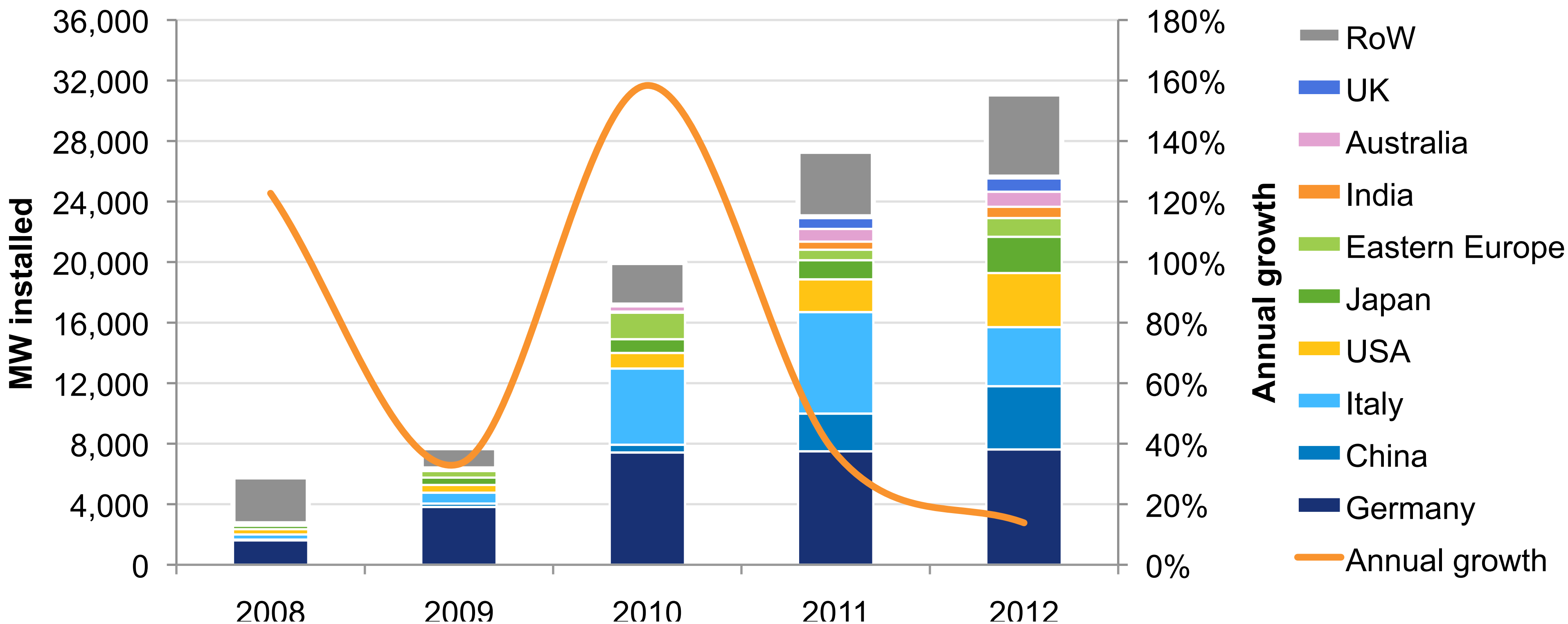
Solar Expertise

- 20 Analysts
- 6 Offices in USA, Europe, Asia
- Market intelligence to >250 leading solar companies
- Experts in supply chain and downstream research

- 6,000 employees in 30 countries
- 2012 Revenues of $1.5 billion
- Parent company of CERA – the world's leader in Energy research

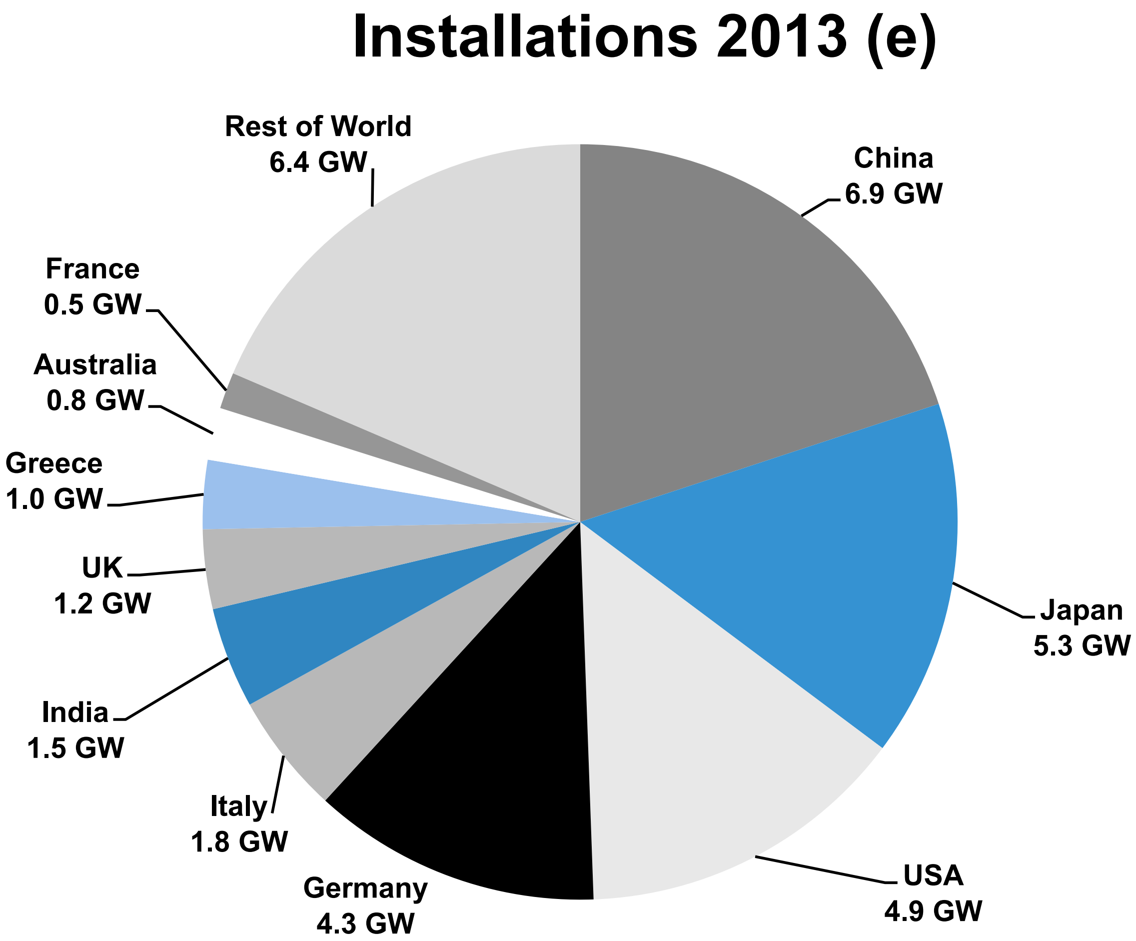
Market Trends

PV Installations in 2012



- Installations amounted to 31.1 GW in 2012 (14% up Y/Y)
- Germany installs 7.6 GW – far higher than 3.5 GW target corridor
- China became 2nd largest market – will be key in 2013
- Japan, USA, India, Eastern Europe became major drivers in 2012

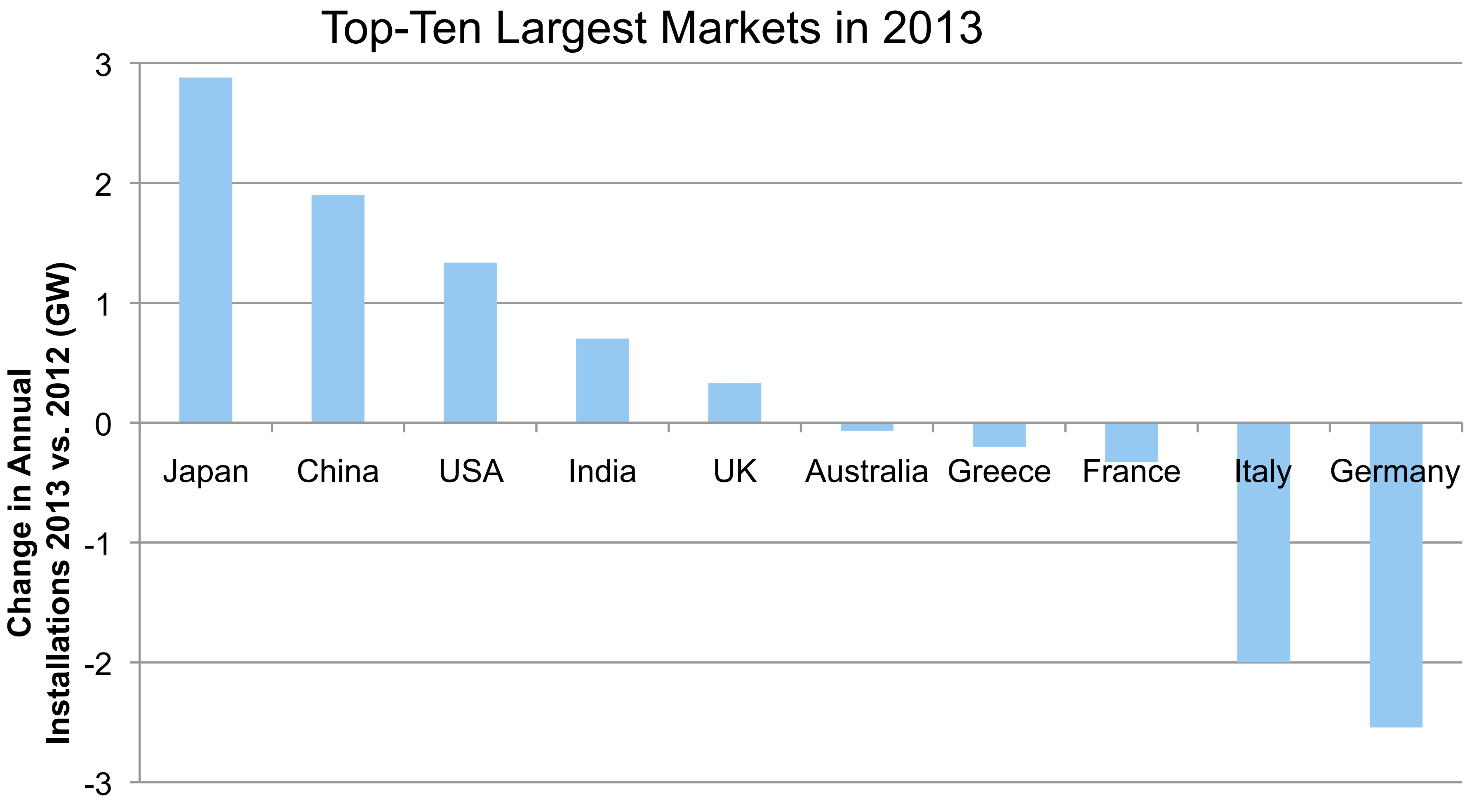
PV Demand Market Tracker - Summary
Ten Largest End-Markets in 2013



2013 Total Installations = 34.5 GW
Annual Growth = 13%

Source: IHS PV Integrated Market Tracker Q2 2013

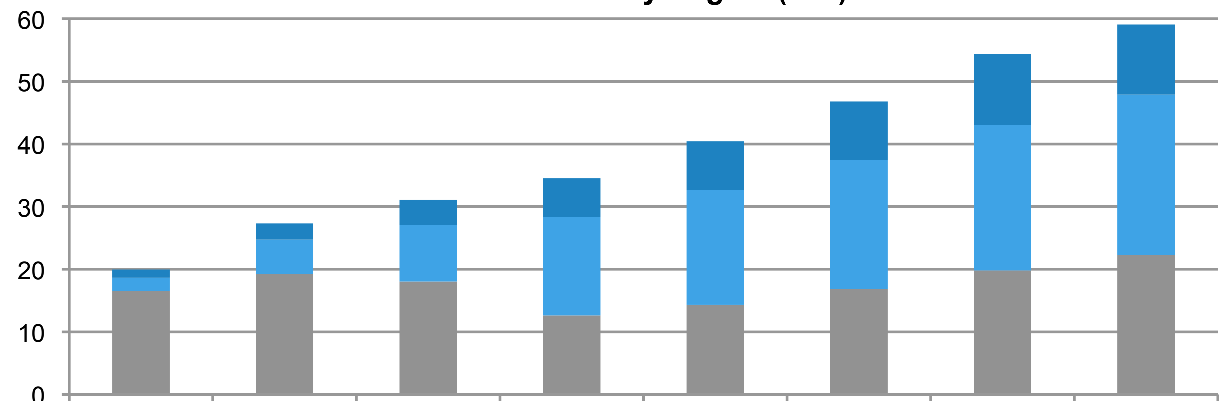
Where Will Growth in 2013 Come From?



Global Demand Forecast

- Installations are forecast to grow quickly in Asia, with 25.6 GW installed in 2017, contributing to a global market of 59 GW.
- Installations in EMEA are forecast to decline in 2013 and 2014, before recommencing growth in 2014. Its share of global installations will decline from 70% in 2011 to 35% in 2016.

PV Installations Forecast by Region (GW)

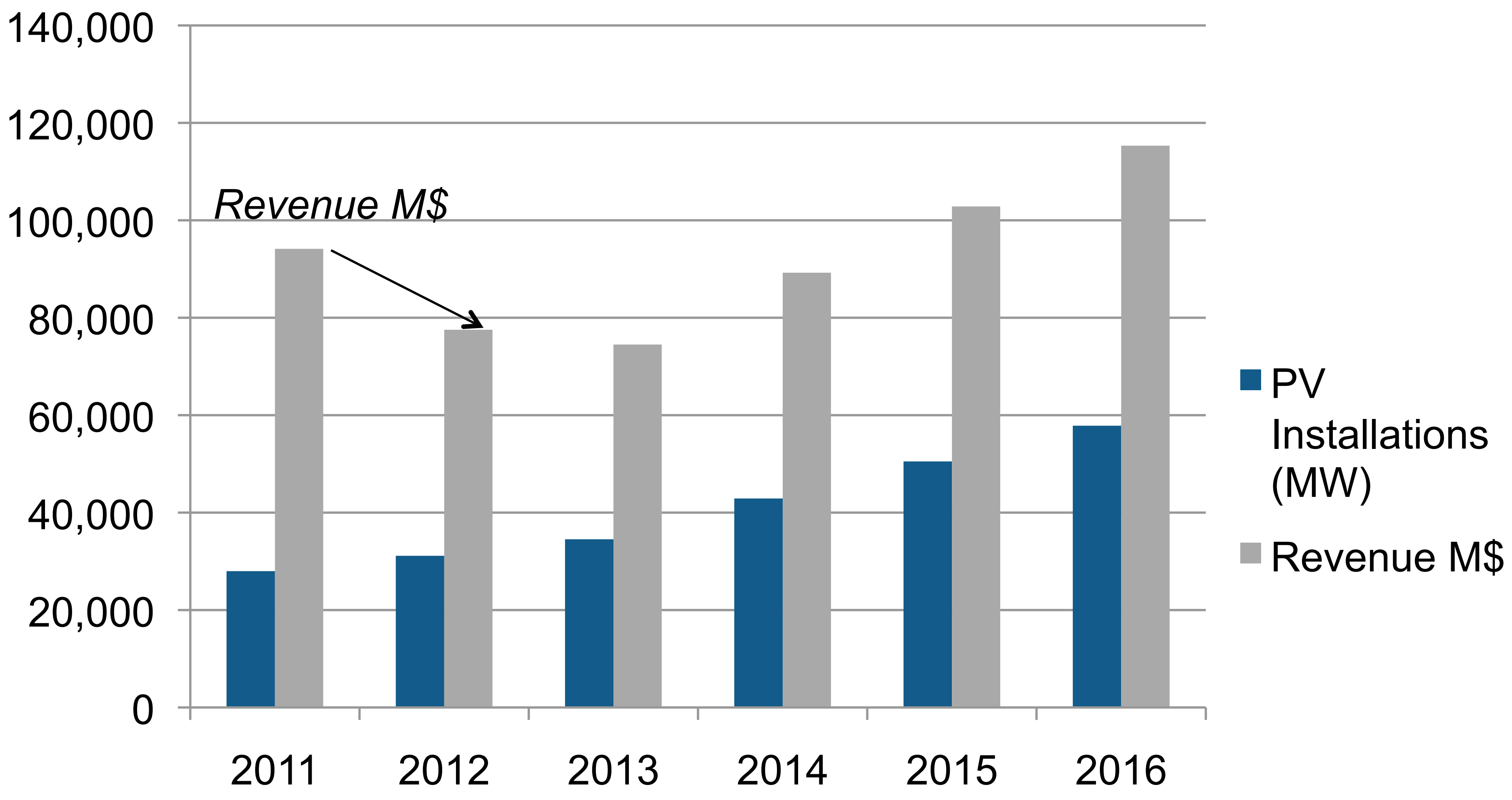


	2010	2011	2012	2013	2014	2015	2016	2017
Americas	1.3	2.6	4.1	6.2	7.8	9.4	11.4	11.2
Asia	2.1	5.5	9.0	15.7	18.3	20.6	23.2	25.6
EMEA	16.6	19.2	18.0	12.6	14.3	16.8	19.8	22.3

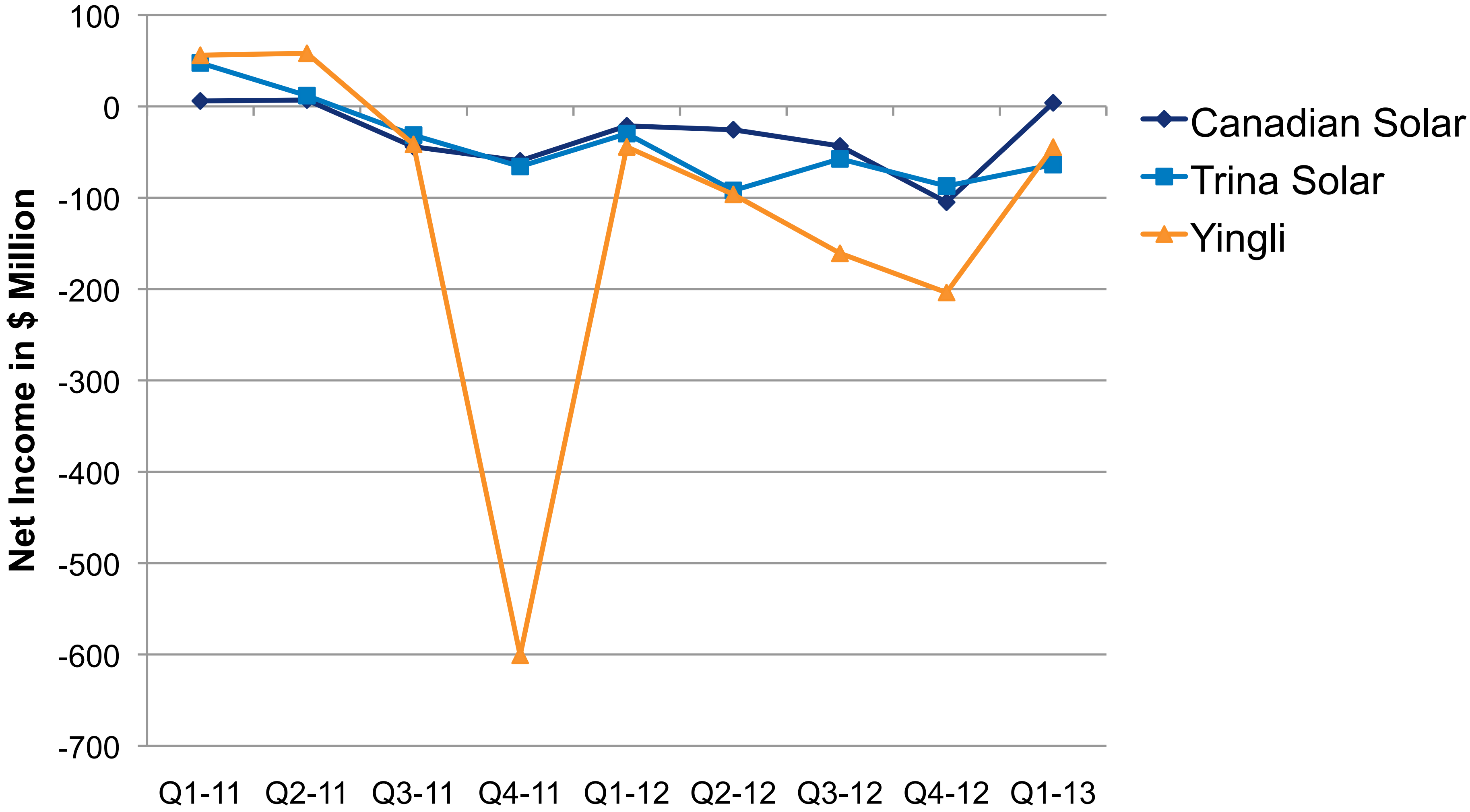
Source: IHS PV Market Tracker Q1 2013

Since 2nd half of 2012: „How to survive the next 3 months?"

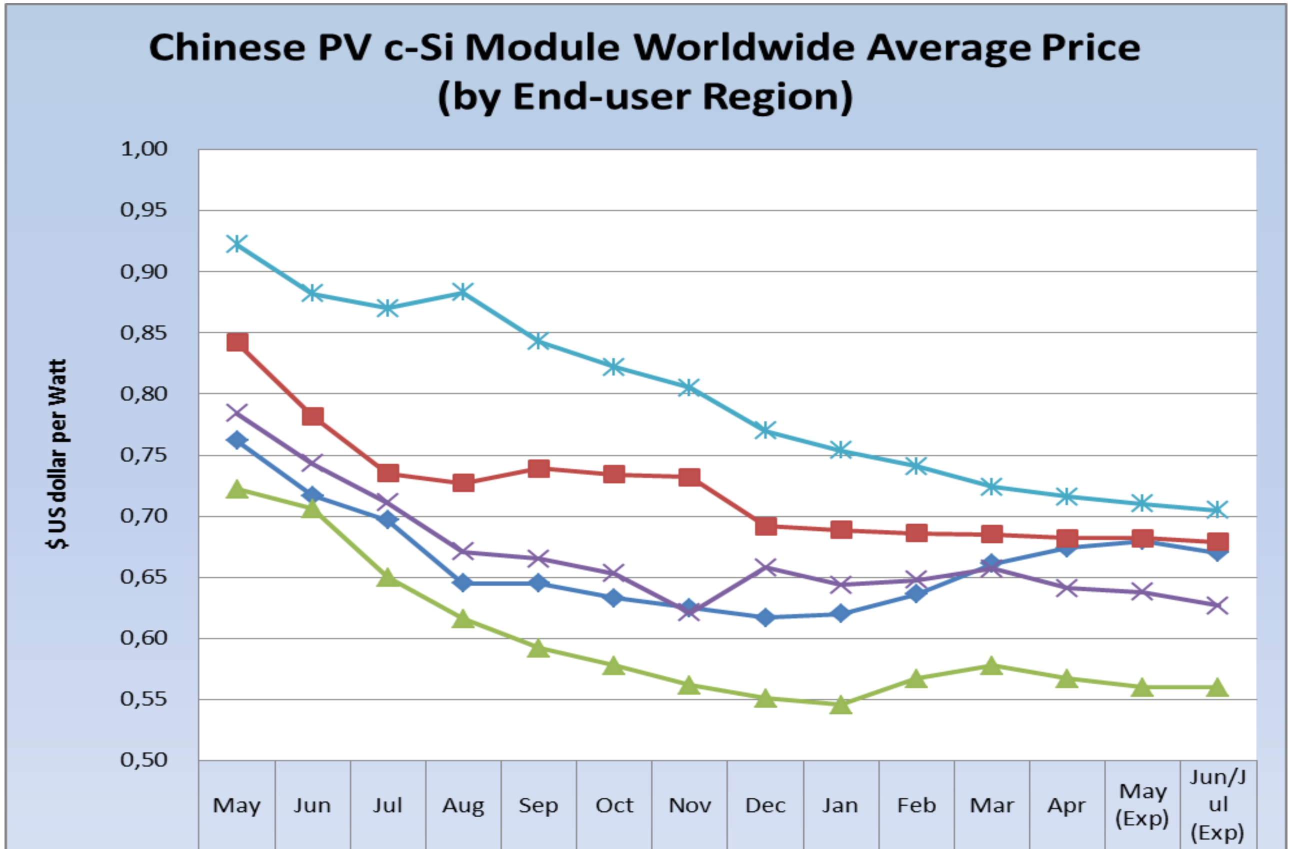
In 2012 & 2013 installations are growing but Revenue is not



Trend Reversal After Six Consecutive Quarters of Loss



Tier 1 suppliers improve profitability



	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May (Exp)	Jun/Jul (Exp)
EU	0,762	0,717	0,697	0,645	0,645	0,633	0,625	0,617	0,620	0,636	0,661	0,674	0,680	0,670
NAFTA	0,842	0,782	0,735	0,727	0,739	0,734	0,732	0,692	0,689	0,686	0,685	0,682	0,682	0,679
China	0,722	0,706	0,650	0,616	0,592	0,578	0,562	0,551	0,546	0,567	0,578	0,567	0,560	0,560
ROW	0,784	0,743	0,711	0,671	0,665	0,653	0,621	0,658	0,644	0,648	0,657	0,641	0,638	0,627
Japan	0,922	0,882	0,870	0,883	0,843	0,822	0,805	0,770	0,754	0,741	0,724	0,716	0,710	0,705

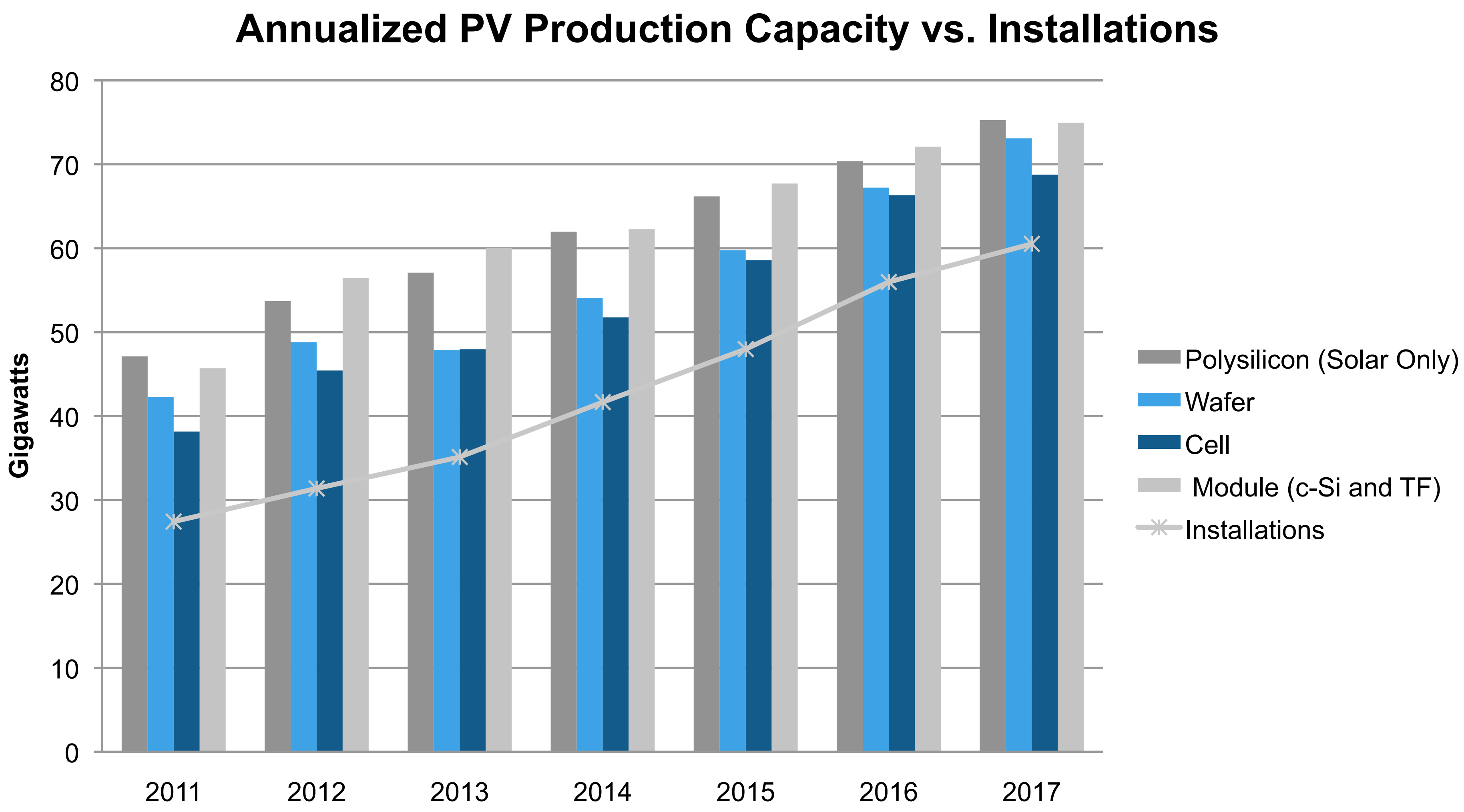
Source: IHS Module Price Index , April 2013

Observations

1. Modules Prices are stabelizig since February
2. Profitable markets in Japan and some European markets
3. High utilization in Q1

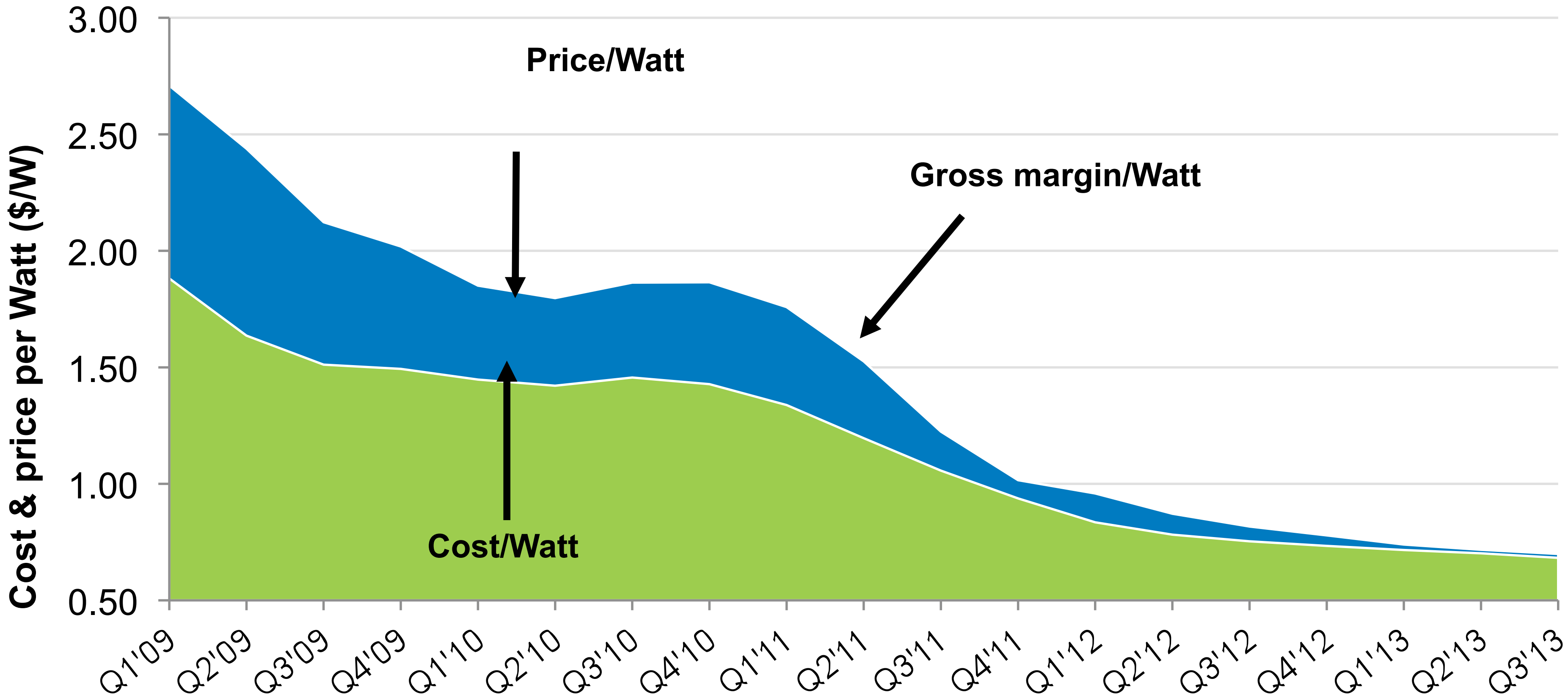
The IHS Solar Module Price Index shows that average Chinese module prices of €0.52/ Watt ($0.67/W) in April 2013.

Still, large overcapacities will compress margins in 2013



Source: IHS PV Market Tracker Q1 2013

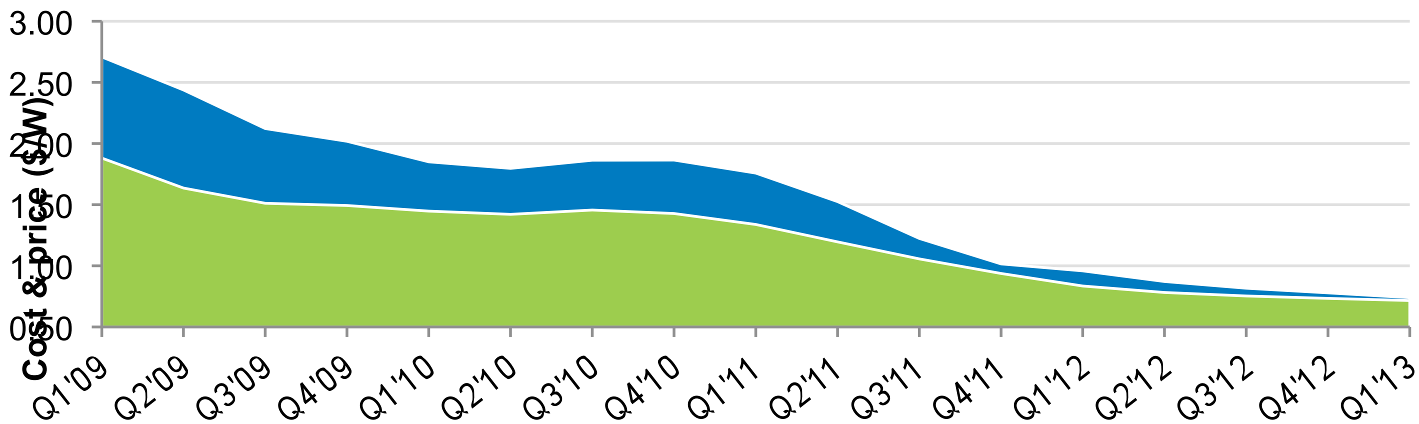
Crystalline PV Module Costs & Margins



- Double-digit margins days are over. Prices collapsed in 2011/12
- Margin squeezed to just 9% end of 2011, down from 25% at start
- Q1-Q3 2013 – 2-3% gross margins forecast (industry average)

Industry Realities of 2013

1. PV production is already a commodity business
   - Double-digit margins days are over
   - Production cost do not differ much among peer groups e.g. 2-4cts/W or 4-8%
   - Advantages in production cost are not sustainable e.g. FLSR
2. Very limited liquidity for Investments
   - Accelerated depreciation / New technologies or capacities have to payback quickly (<18 months)
3. Uncertainty of factory utilization
   - Local content and trade barriers hurt cost per watt
   - A very large factory in China can be a burden in accessing regional markets



EU Antidumping Duties

Impact of EU Antidumping Duties on Prices and Installations

1. IHS does **not expect the high duties to be fully implemented** from 6th August, but the negotiation of a diplomatic agreement.

2. **Module prices in Europe will increase** as a result of the preliminary duties. This will lead to smaller installation volumes in the second half of the year.

    1. IHS assumes that module vendors are unable to absorb the cost of the antidumping duty given the fact that most are only just at breakeven point. An average duty of 47% would result in a module price increase to $0.98/W, up from the current level of $0.67/W.

3. IHS' sensitivity analysis of project IRRs shows that the **most price sensitive market segments are German ground-mounted and large rooftops without self-consumption.**

    1. A system price increase of 10% in Germany (corresponding to a module price increase of 20-30% depending on system size) would reduce ROIs to below 7% and seriously dampen investor appetite in this sector.

    2. Other segments such as residential and commercial applications will be less impacted by module price increases (as modules contribute to a relatively smaller share of overall system costs) and will continue to provide interesting IRRs for owners and investors, albeit at slightly lower values.

4. **Considering developments up to June 4th, IHS has reduced its 2013 demand forecast for Europe by 1.3 GW.** Module prices in Europe are forecast to increase to a level of $0.80/W.

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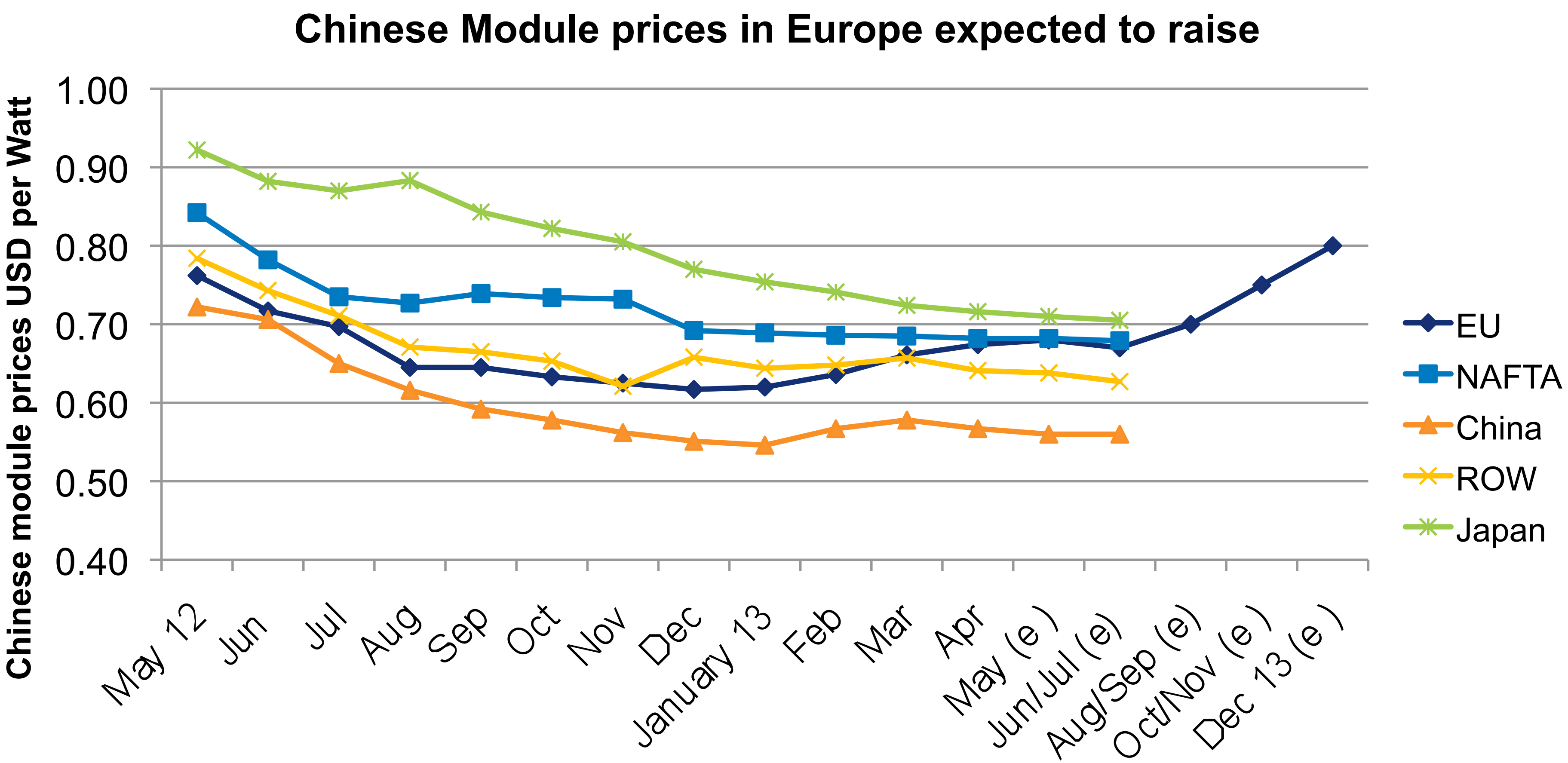
Outlook of Chinese Module prices in Europe if Antidumping tariffs would apply from June 06, 2013

IHS expects Chinese modules to become more expensive up to a level of USD 0.845 per Watt (Euro 0.65 per Watt). At higher prices buyers will tend to buy non-Chinese goods.



Longterm Outlook of Installations

PV Installations and Demand of Polysilicon

- Installations will reach close to 60 GW by 2017.
  - The route to 2017 looks stable, PV is recognized by many countries
  - Crystalline Silicon will be the primary technology, taking market share of Thinfilm
  - In a „best case“ c-Si could represent 55GW out of 58 GW in 2016
- To estimate installations beyond 2016 three scenarios are applied:
  1. Moderate growth scenario: 10% year over year, resulting to 150 GW in 2025.
     - Scenario 1 shows a nearly linear growth over the next decade
  2. Accelerated growth:16% year over year, resulting in 224 GW in 2025.
     - Scenario 2 shows exponational growth, accelerating from 2020. The 16% growth rate is the CAGR of the actual forecast 2012-2016.
  3. High growth 2025: we look at the 300GW per year scenario which is initiated by Solarpraxis

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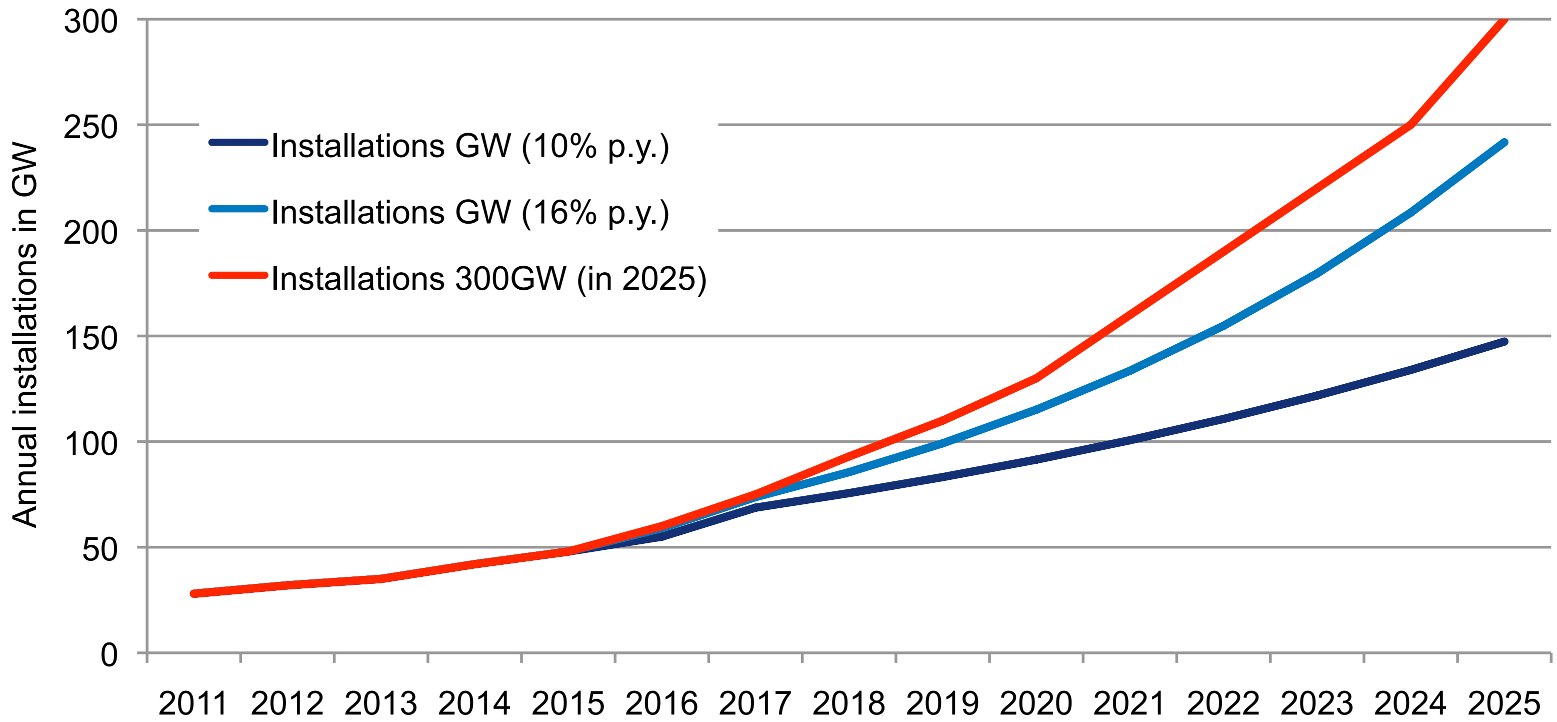
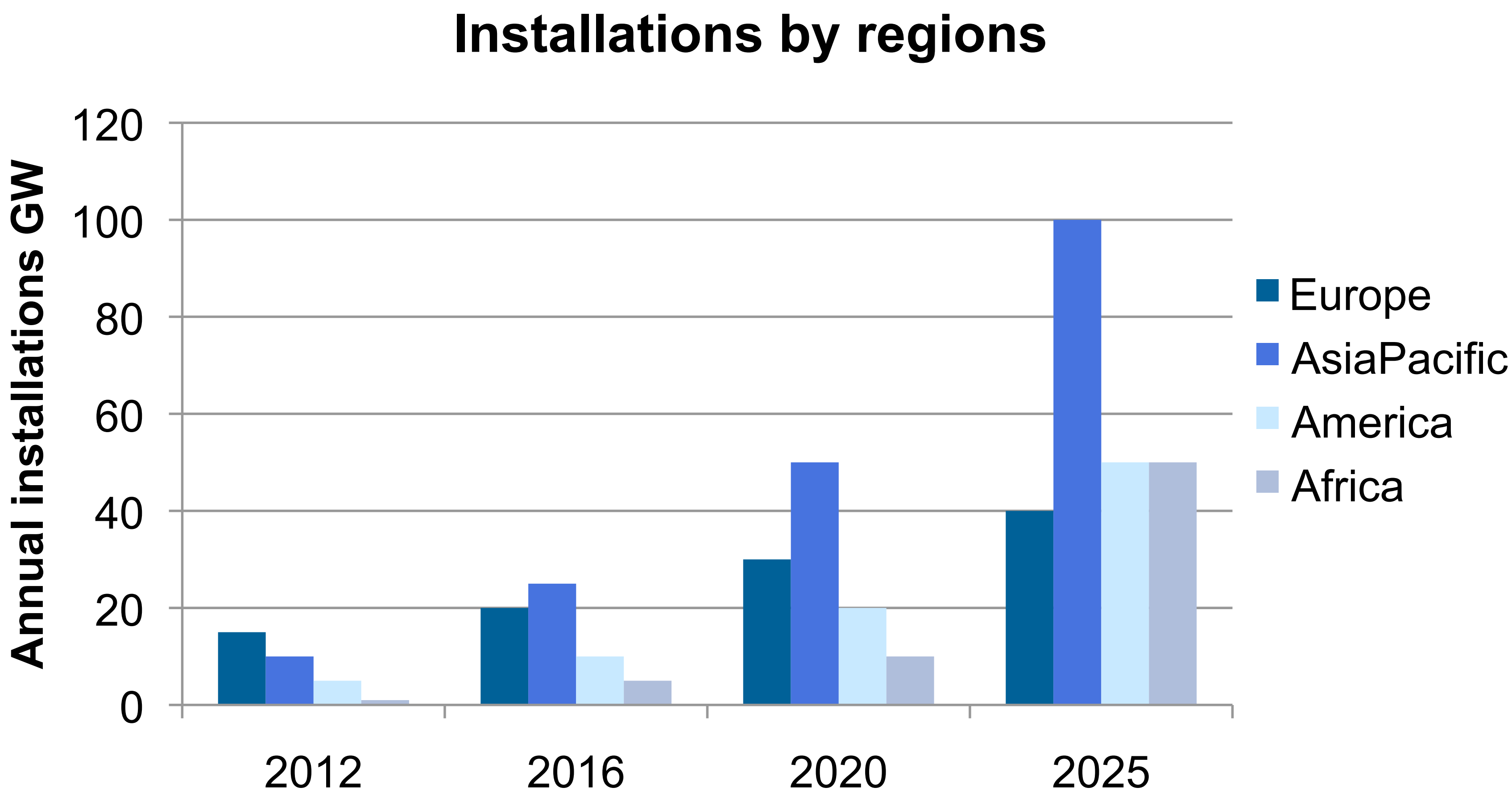
PV installation in 2025_ three scenarios

- The moderate case: 150 GW per year in 2025, 10% p.y market growth from 2017 to 2025
- Accelerated case: 225 GW per year in 2025, 16% p.y market growth from 2017 to 2025
- High case: 300 GW per year in 2025

PV installation scenarios 2017 - 2025



Assuming accelerated growth of 16% per year, IHS expects Asia/Pacific to drive the market from 2016



Source: IHS Solar Polysilicon longterm forecast Dec. 2012

* Breaking out the installations by region is applying following assumptions:
- Period 2012-2016_ the Market will be driven by Europe, followed by Asia/Pacific(Japan, China, India)
- Period 2016-2020_ Asia/Pacific will become the centre of gravity for installations (South East Asian countries, Japan, China, India)
- Period 2020-2025_ Asia/Pacific will invest in PV as a major pillar of energy supply. US and Africa will adopt .

Can China install 25 GW p.a in 2020?

- Dr Wang Jin „Promoting the financing of PV products“, NDRC at SNEC 2013
- „Our goal is to make PV Power business an attractive and sustainable investment.“ (notes H Wicht)
  - Current PV plants are owned by Power and Solar companies
  - PV project financing is becoming a burden for solar companies
  - Transition from capacity to performance based investments
- Measures:
  - Enhanced quality assurance is a key to PV industry growth
  - International Norms and certifications to guarantee performance ratios
  - Enhanced FIT to provide stable ROI
  - Enhanced Grid connections to guarantee power off take
- Attract investments from Financial sector to Solar Power
  - Make PV Power Parks an independent asset

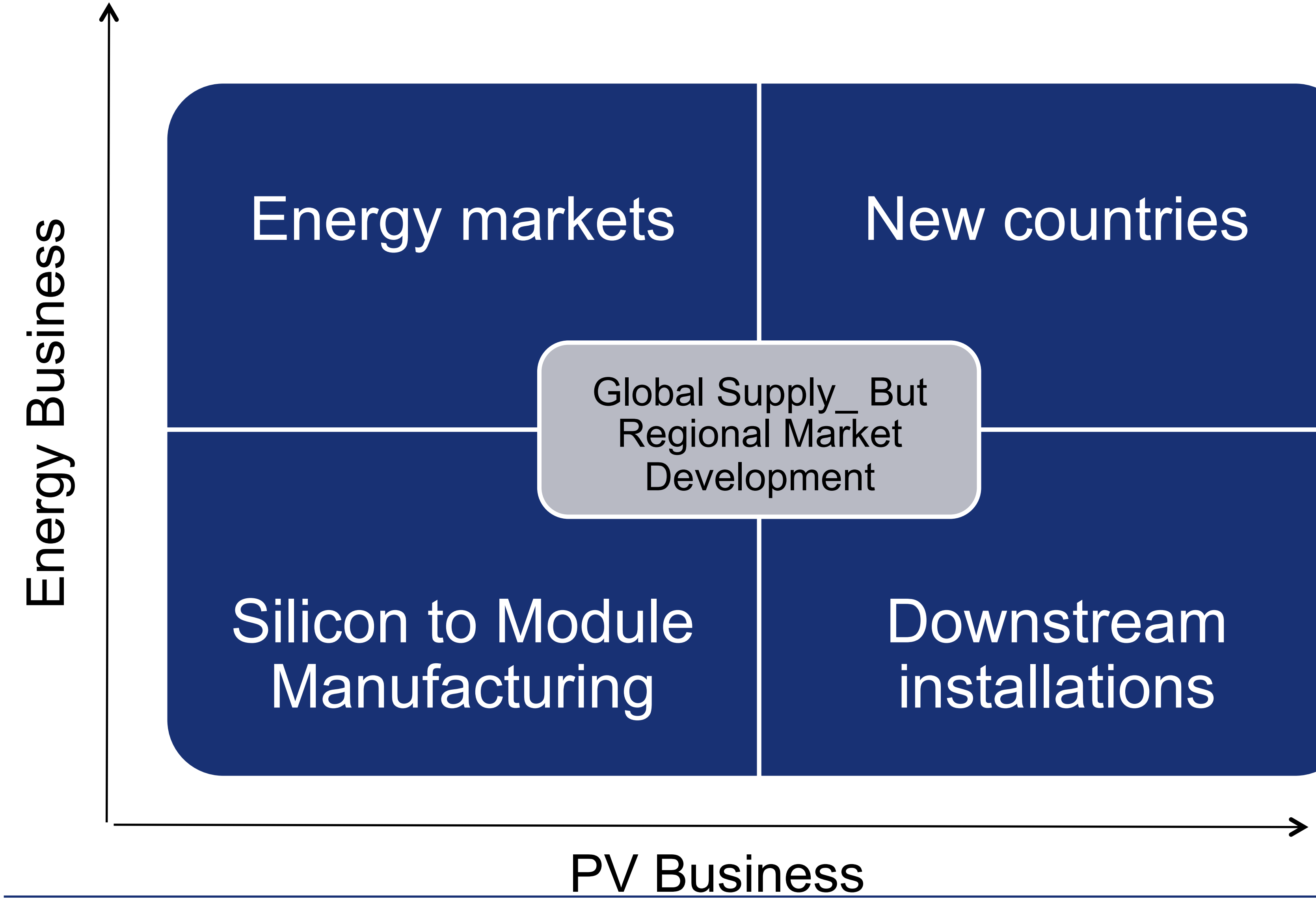
Opportunities in Solar

Opportunities in Solar_or playing „Monopoly“?

Energy Business

PV Business

Opportunities in Solar_or playing „Monopoly“?



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Crisis , what Crisis?

1. **First signs of Trend Change at Tier 1 suppliers**
   Excellence in Manufacturing will allow margins, marketshare and leadership
2. **Tier 1 suppliers are rethinking Strategy**
   - How much Downstream? Where to invest?
   - Vulnerable, if 100% made-in China
3. **New Regional Markets are opening up**
   - More than 100 countries will open up soon for Solar
   - US and European companies are doing well in Emerging Markets
4. **Photovoltaics is the Fast Track to enter the Energy business.**
   - New Business Models wanted

Silicon to Module Manufacturing

Re-Think Strategy

New countries

Energy markets

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