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The Basics

What is Market Research?

Is a specific discipline where something is counted from point a to point b, then point b to point c, and so on. The point is to eliminate double counting and arrive at specific metrics to define a market

In solar, when following the module it is from manufacturer to first point of sale, then first point of sale to the next point and so on, until the module is installed.

Market research is the objective study of a subject using data gathered through primary research to characterize, analyze and forecast demand and supply for, in this case, the photovoltaic industry.

Market research makes use of data to identify trends and customers, and analyze competitors.

**In the case of this practice, the data go back >30 years.
In market research, you get the data, get the data, get the data and then interpret the data.**

Primary research is direct contact with the person buying and selling the product, technology, widget, etc.

The purpose is to provide an objective analysis that managers and executives can use for business planning purposes.

Industry Metrics

2010 Inventory into 2011: The megawatts of inventory, primarily on the demand side, at the beginning of 2011.

2011 Announced Capacity: All capacity, nameplate, run rate (commercial) or simply intended, that was announced for 2011.

2011 Announced Production: Manufacturer announced production does not necessarily correspond to what the manufacturer shipped, and, may or may not include outsourced technology. Module assemblers that do not develop the semiconductor technology (the cell) are often included in this number. Announced production is where double and triple counting is found, and is the primary culprit for oversizing PV industry shipments.

2011 Commercial Capacity: Run rate PV manufacturing capacity, that is, what is capable in a calendar year of producing commercial technology, factoring out equipment taken out of service, etc.

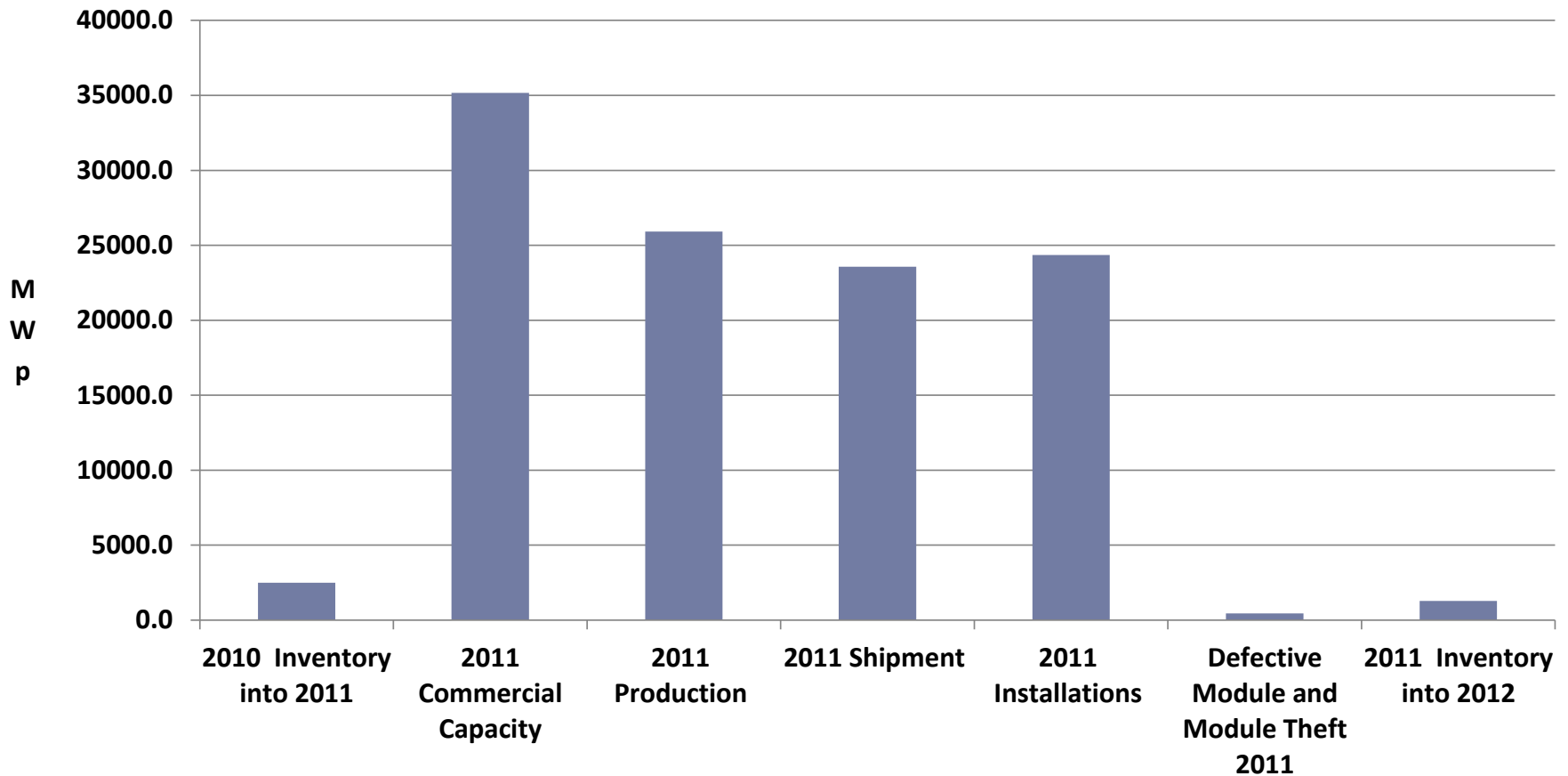
2011 Production: Technology produced, but not necessarily shipped, by the original technology manufacturer in the calendar year that is being studied.

2011 Shipments: Technology shipped from the original manufacturer to the first point of sale (first buyer) in the market. First buyers include installers, system integrators, retailers, distributors, module assemblers, end users and other technology manufacturers

2011 Installations: Technology that was installed in a calendar year. Installations include inventory lag, that is, the inventory represented by the first bar in the chart.

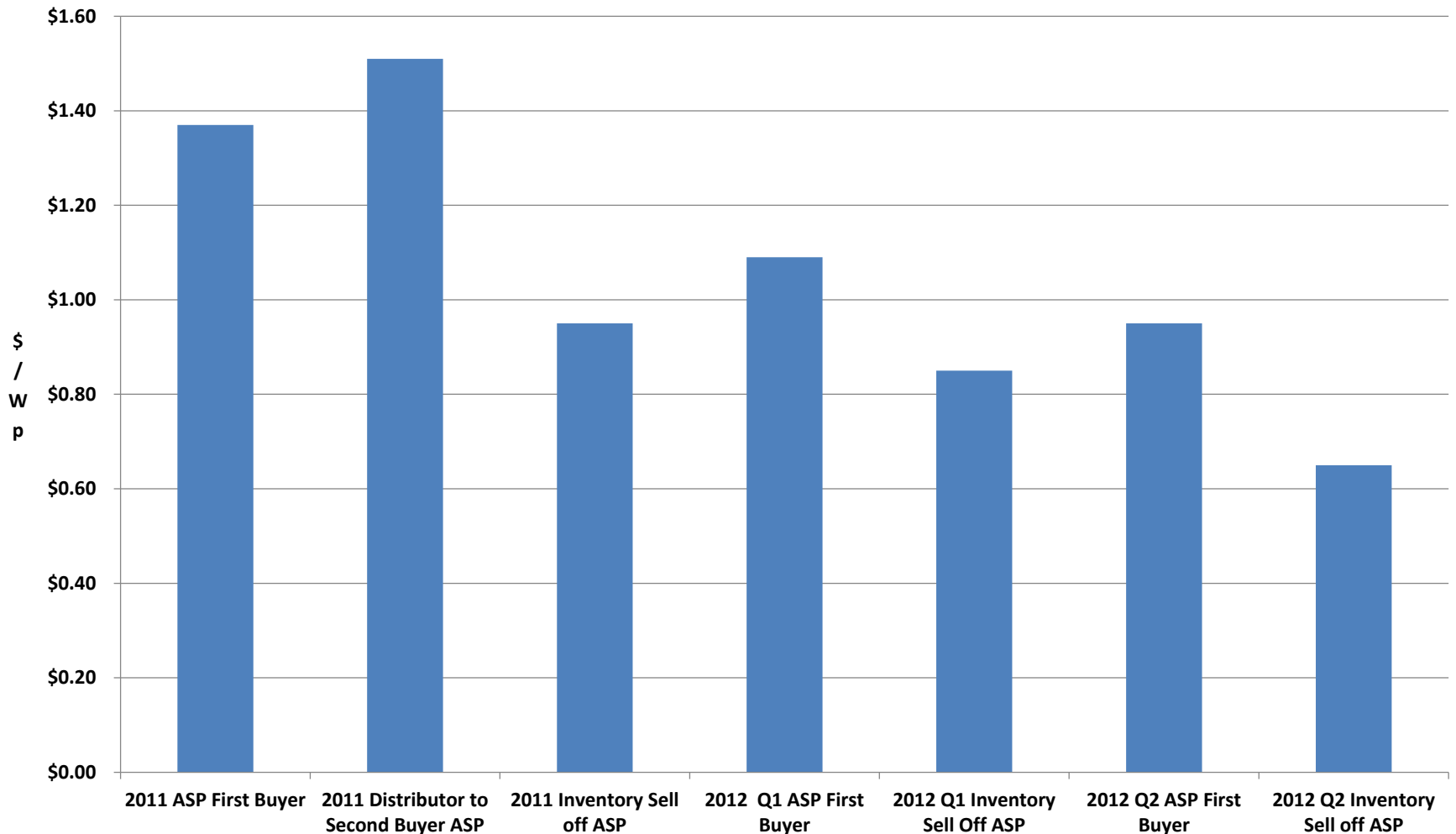
2011 Inventory into 2012: Megawatts of inventory, typically held on the demand side, at the beginning of 2012.

2011 into 2012 Global Statistics



**Installations were higher than Shipments in 2011 because of inventory lag.
High levels of inventory and manufacturing capacity will continue to be a problem throughout 2012
The difference between production and shipments is supply side inventory
The last bar is demand side inventory**

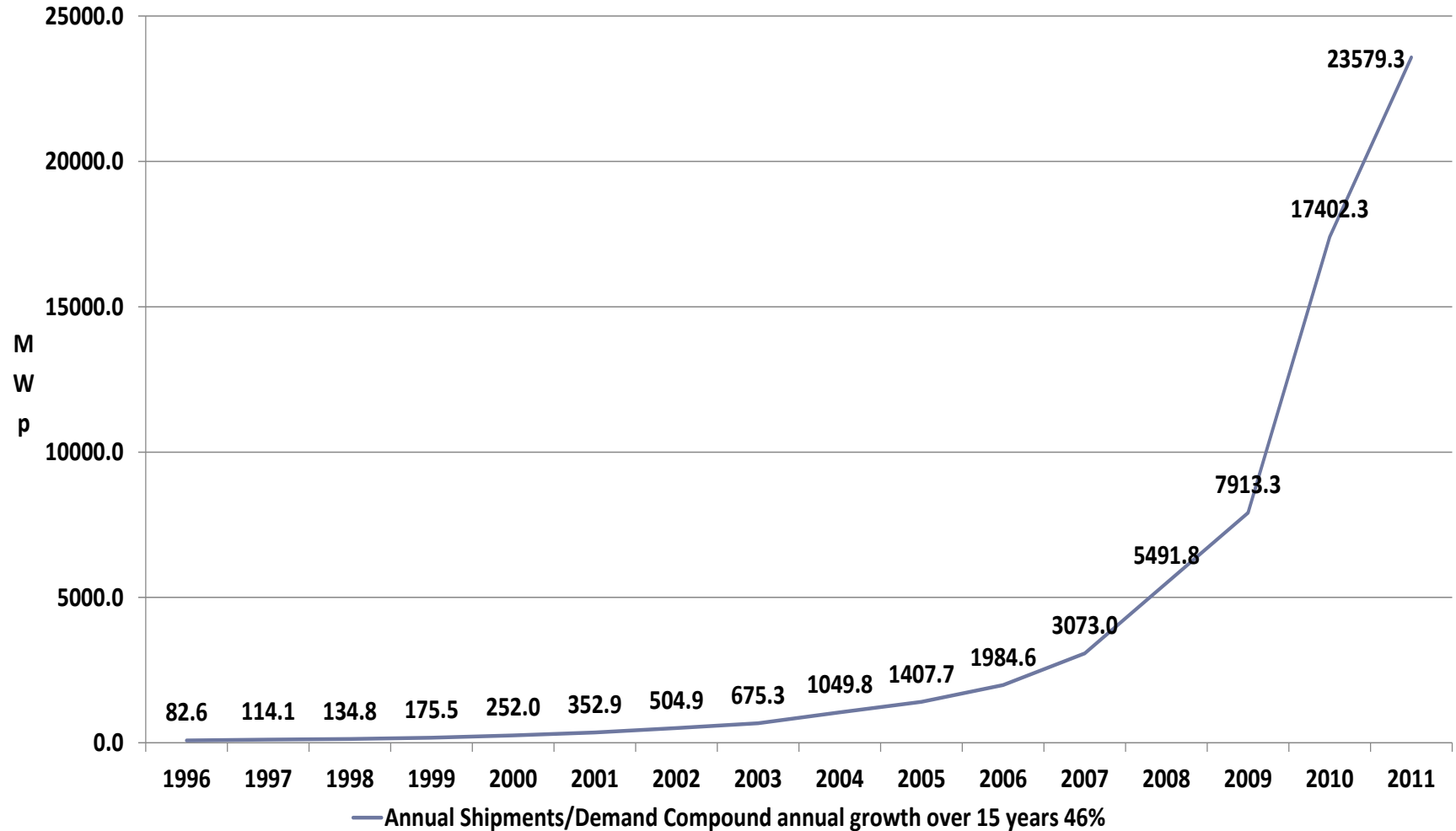
There are different metrics for pricing too



Currently, low prices for resold inventory and expectations of lower prices going forward are holding prices down as well as delaying solar industry recovery

From 2006 through 2011 the PV industry had a 60% compound annual growth rate. From 1996 to 2011 the industry had a 46% CAGR

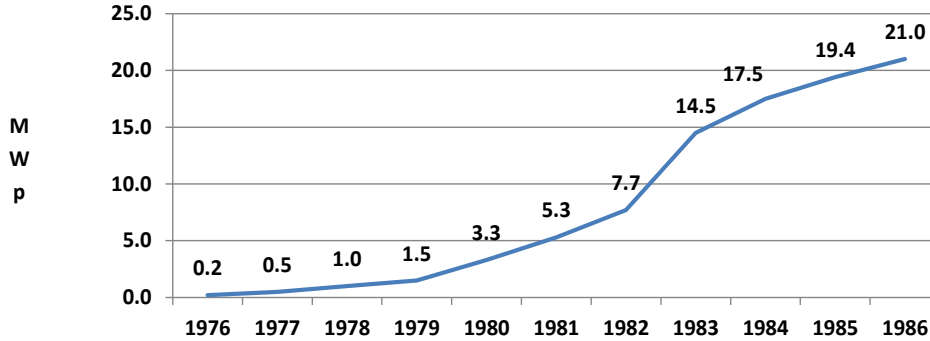
The high growth experienced by the PV industry is one hallmark of an immature industry
From 2004 through 2010 the PV industry behaved like a teenage boy that had just gotten his driver's license



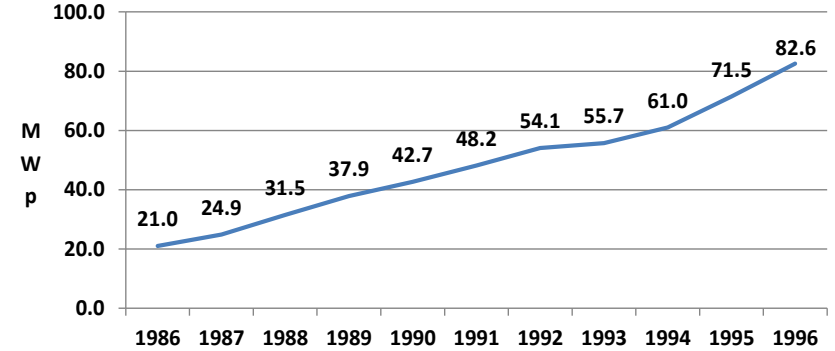
Supply and Demand

PV Industry Demand History

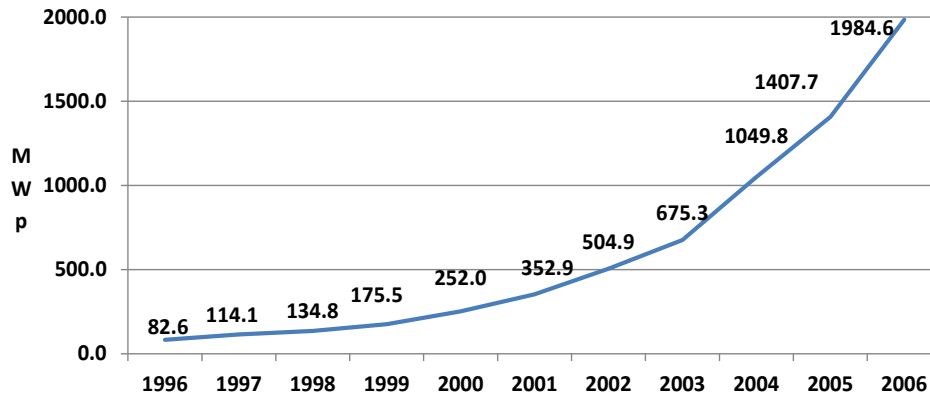
1976 to 1986, CAGR 59%, Government and utility grid connected demonstration systems drove demand



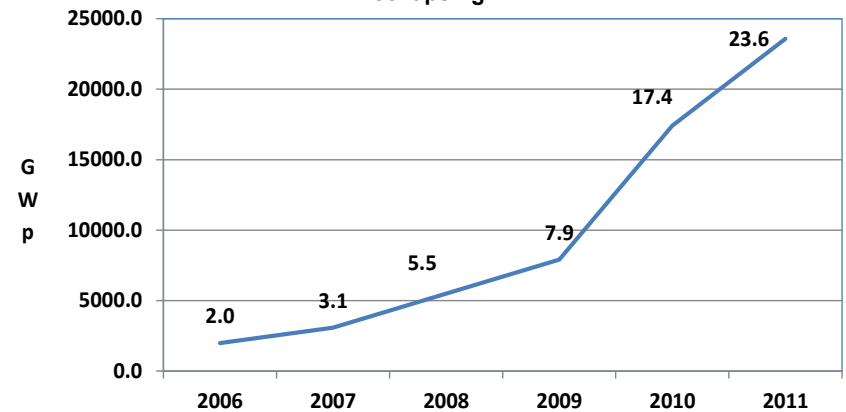
1986 to 1996, CAGR 15%, a relative dearth of government and utility programs slowed accelerated growth



1996 to 2006, CAGR 37%, Incentive Programs in Germany, Japan and California & the Era of the Feed in Tariff



2006 to 2011, CAGR 64%, EU FiTs spread globally and begin collapsing



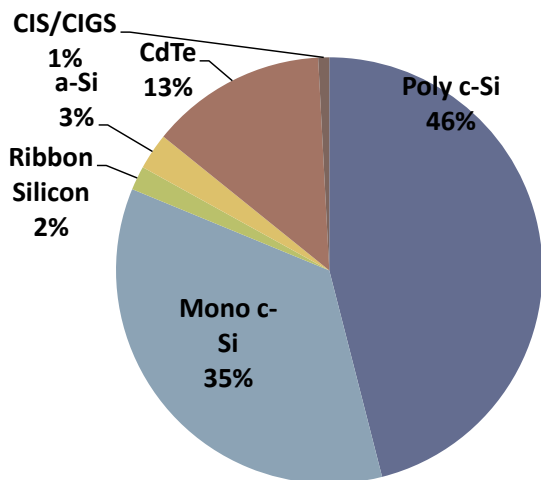
2011 Demand, supply and installations by region

Region	2006	2007	2008	2009	2010	2011	CAGR 2006- 2011	2011 Install. MWp	% Install. of Demand	2011 Regional Shipments	MWp Delta Demand /Shipments
Europe	1093.9	2178.7	4338.5	6568.0	13944.1	14854.9	68%	16171.6	109%	1618.9	13236.0
% Total	55%	71%	79%	83%	80%	63%					
Asia	506.1	376.8	549.2	561.8	1219.9	4267.4	53%	4633.2	109%	17757.4	-13490.0
% Total	26%	12%	10%	7%	7%	18%					
North America	226.2	318.1	395.4	553.9	1566.2	2593.7	63%	1529.0	59%	781.2	1812.5
% Total	11%	10%	7%	7%	9%	11%					
West Asia	67.5	76.8	87.9	79.1	52.2	471.6	48%	729.6	155%	119.0	352.6
% Total	3%	3%	2%	1%	0%	2%					
Oceania	26.4	43.0	43.4	35.6	365.5	825.3	99%	742.7	90%	0.0	825.3
% Total	1%	1%	1%	0%	2%	4%					
Southeast Asia	23.8	27.7	28.9	31.7	104.4	212.2	55%	201.6	95%	3302.8	-3090.6
% Total	1%	1%	1%	0%	1%	1%					
Latin America	17.9	22.4	19.8	27.7	60.9	82.5	36%	74.8	91%	0.0	82.5
% Total	1%	1%	0%	0%	0%	0%					
Africa	15.9	21.5	19.2	23.7	17.4	33.0	16%	32.7	99%	0.0	33.0
% Total	1%	1%	0%	0%	0%	0%					
Middle East	5.0	5.5	6.6	27.7	69.6	235.8	116%	233.4	99%	0.0	235.8
% Total	0%	0%	0%	0%	0%	1%					
North Africa	2.0	2.5	3.0	4.0	1.7	2.8	7%	2.8	99%	0.0	2.8
% Total	0%	0%	0%	0%	0%	0%					
Total	1984.6	3073.0	5491.8	7913.3	17402.7	23579.3	64%	24351.4	103%	23579.3	

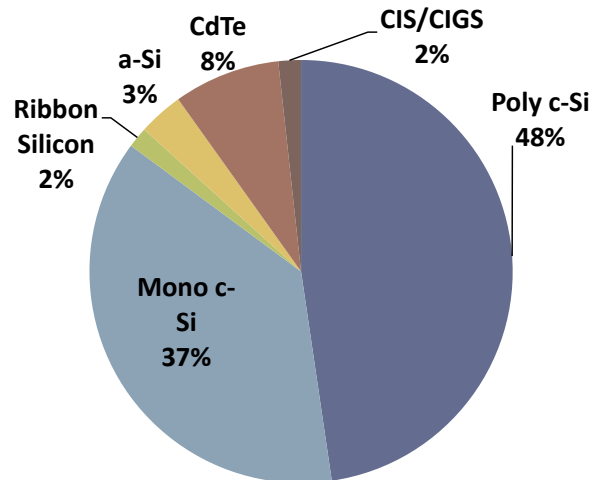
Shipment Shares by Region 1997 - 2011

Year	U.S. % Total	Europe % Total	Japan % Total	ROW % Total	China % Total	Taiwan % Total	Total Shipments MWp	Annual Growth
1997	42%	18%	25%	13%	1%	2%	114.1	38%
1998	38%	21%	27%	12%	1%	2%	134.8	18%
1999	32%	17%	39%	10%	1%	1%	175.5	30%
2000	30%	23%	38%	7%	1%	1%	252.0	44%
2001	27%	24%	41%	6%	1%	1%	352.9	40%
2002	19%	31%	42%	5%	0%	2%	554.9	57%
2003	14%	26%	52%	7%	0%	2%	675.3	22%
2004	13%	26%	52%	5%	1%	3%	1049.7	55%
2005	9%	29%	51%	5%	2%	3%	1407.7	34%
2006	7%	31%	44%	5%	8%	5%	1984.6	41%
2007	8%	32%	29%	5%	16%	9%	3073.0	55%
2008	7%	31%	22%	8%	20%	11%	5491.8	79%
2009	5%	18%	16%	14%	32%	14%	7913.3	44%
2010	6%	15%	12%	14%	37%	16%	17402.3	120%
2011	3%	7%	12%	15%	46%	17%	23579.3	35%
14 Year CAGR							46%	

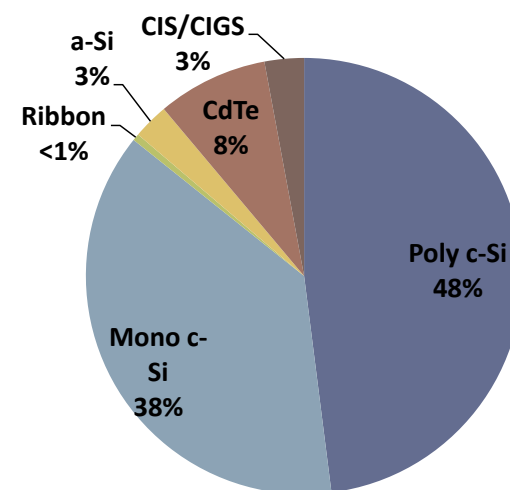
Technology Shares 2009, 2010, 2011



2009 7.9-GWp

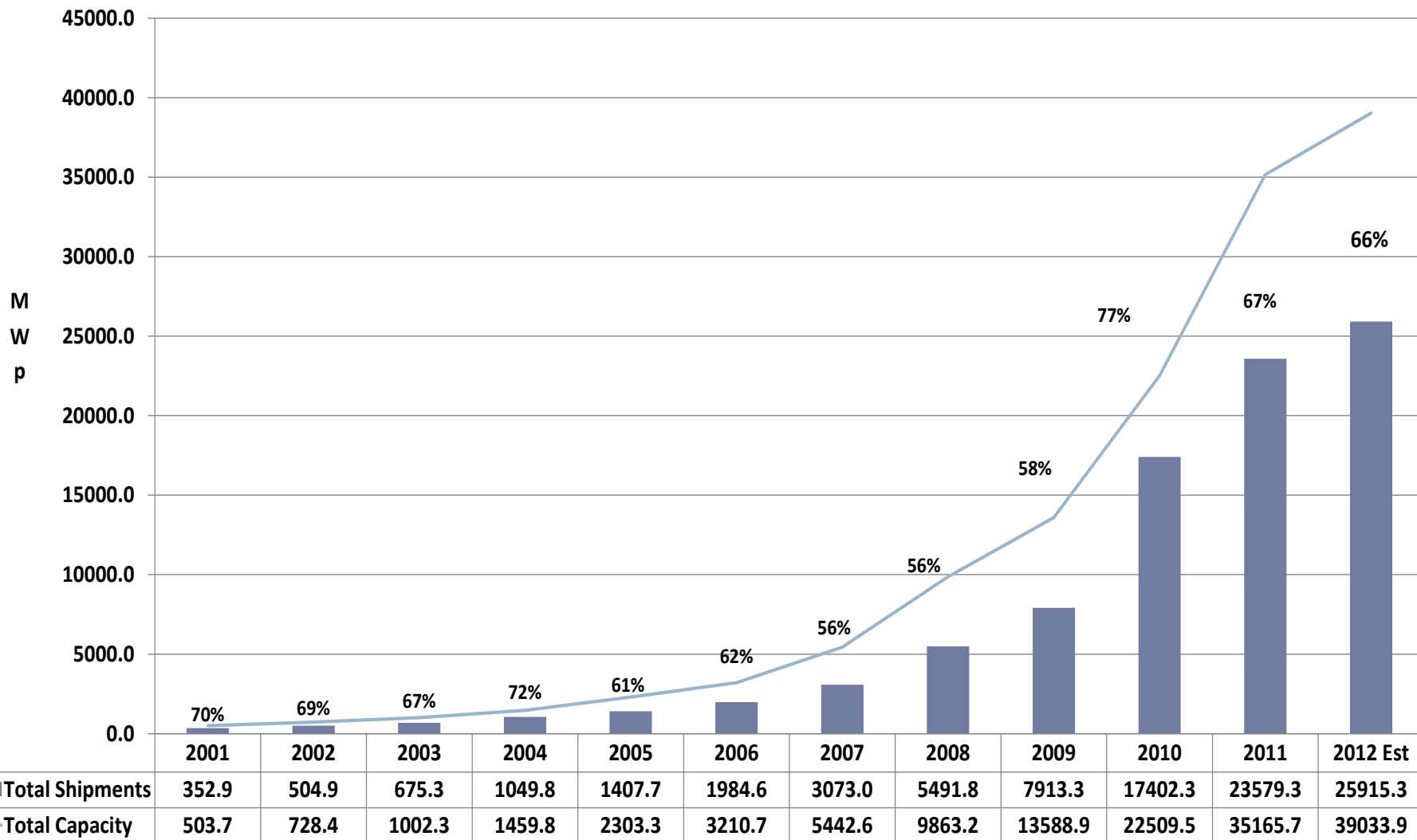


2010 17.4-GWp



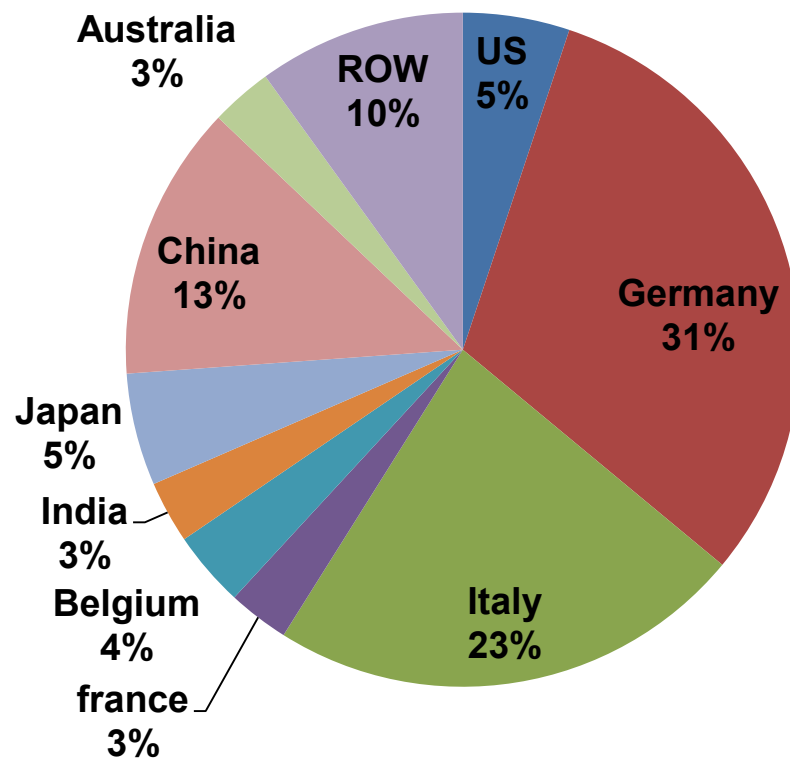
2011 23.6-GWp

Global Photovoltaic manufacturing capacity 2001 to 2012

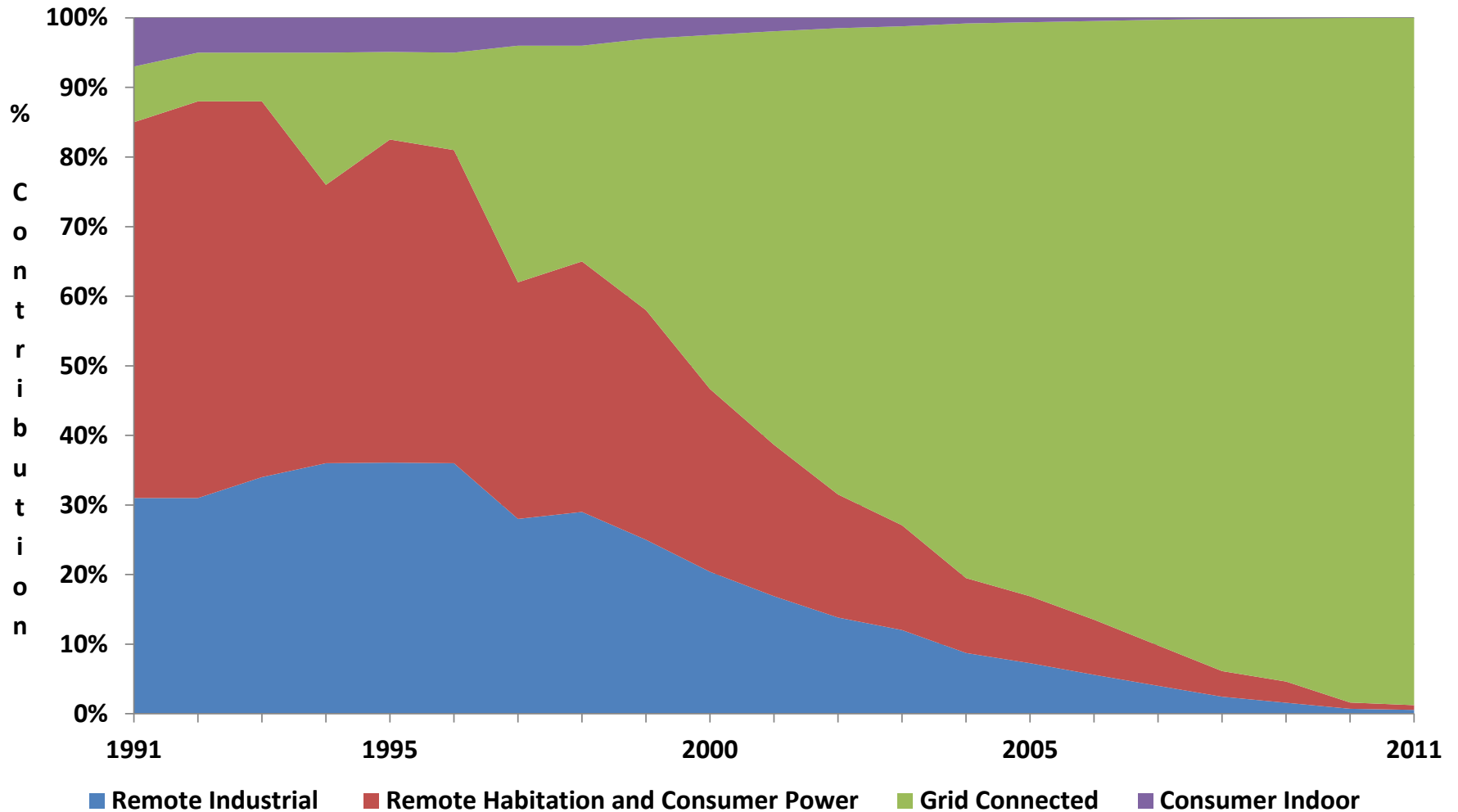


Country Installation Shares 2011

2011 Installation Shares
Demand 23.6-GWp
Installations 24.4-GWp



Application Contribution Over time



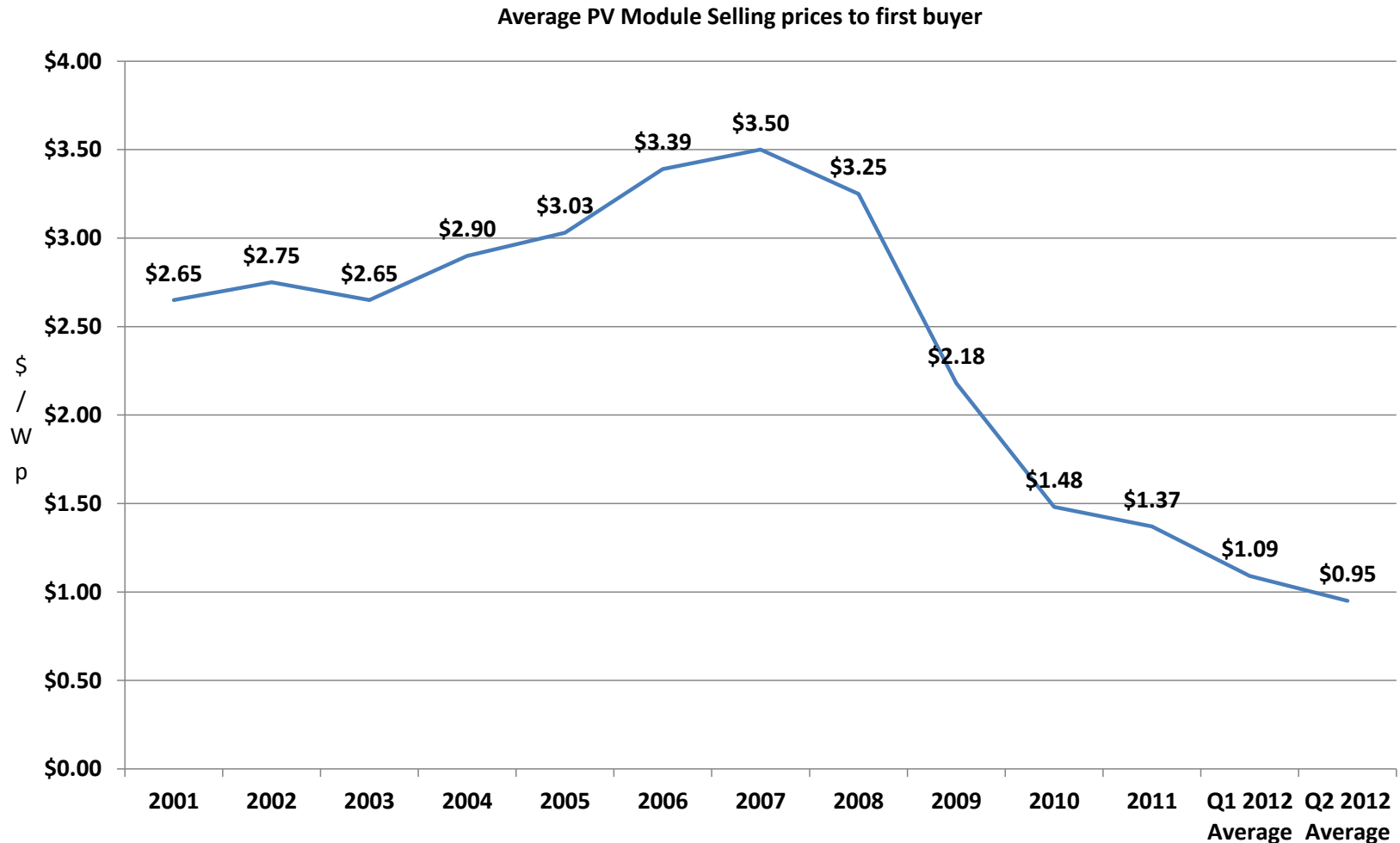
2011 Application Breakdown by Region

2011 Regions	2011 Demand MWp	2011 Instal. MWp	% Grid Res.	% Grid Comm.	% Grid Utility	% Off Grid Industrial	% Off Grid Habitation	% Consumer Power	% Consumer Indoor
North America	2593.7	1529.0	38%	55%	6%	<1%	<1%	<1%	0%
Latin America	82.5	74.8	10%	34%	1%	25%	28%	1%	0%
Europe	14854.9	16171.6	33%	66%	<1%	<1%	<1%	<1%	0%
Middle East	235.8	233.4	13%	73%	1%	9%	3%	1%	0%
North Africa	2.8	2.8	0%	0%	6%	42%	47%	5%	0%
Central & Southern Africa	33.0	32.7	1%	0%	8%	31%	53%	4%	8%
West Asia	471.6	729.6	2%	88%	7%	2%	1%	<1%	<1%
Asia	4267.4	4633.2	40%	59%	1%	<1%	<1%	<1%	0%
Southeast Asia	212.2	201.6	0%	0%	0%	25%	55%	15%	5%
Oceania	825.3	742.7	55%	42%	0%	3%	3%	0%	0%
Total	23579.3	24351.4	35%	63%	1%	1%	1%	0%	0%

Average Module Prices over time

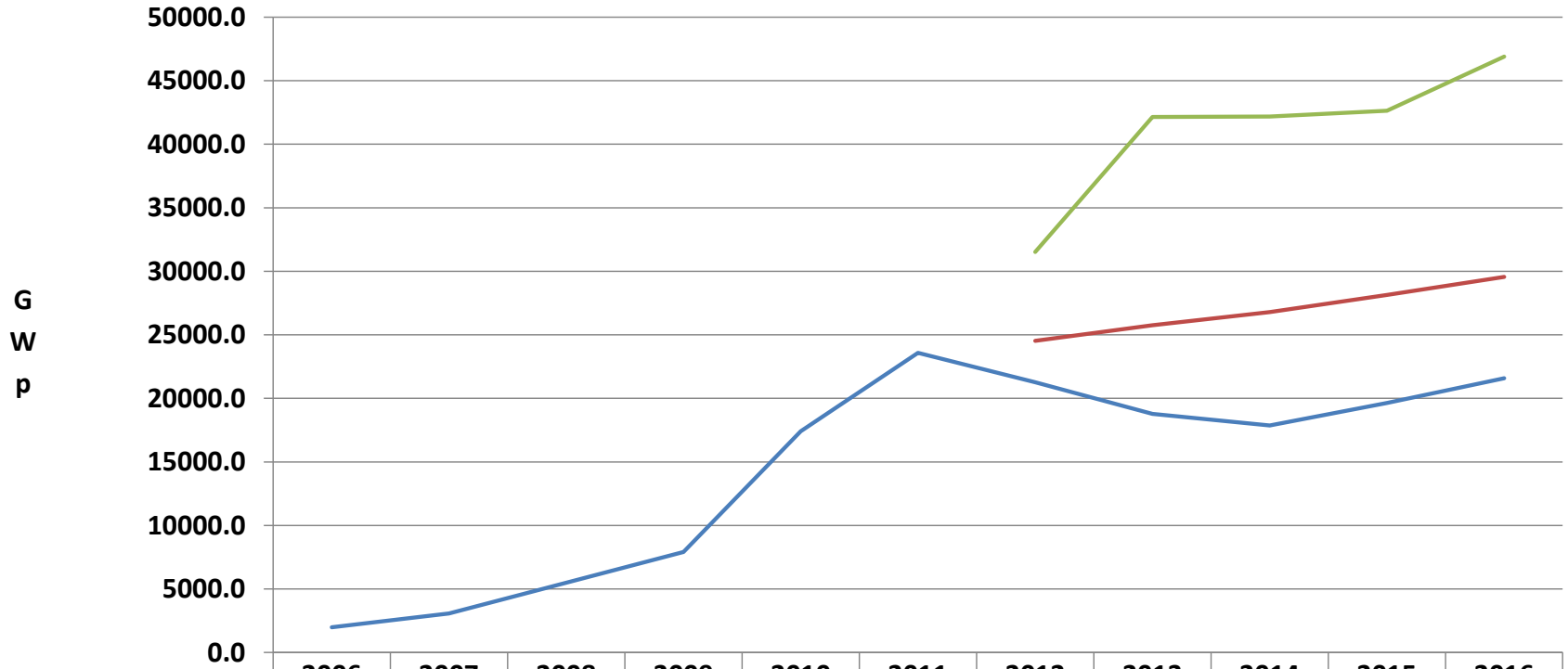
Average module prices: Price is currently the most important competitive factor though, without bankability this loses meaning

The range for modules to first buyers is \$0.50/Wp to \$1.89/Wp
Reselling of inventory is currently averaging 65 cents



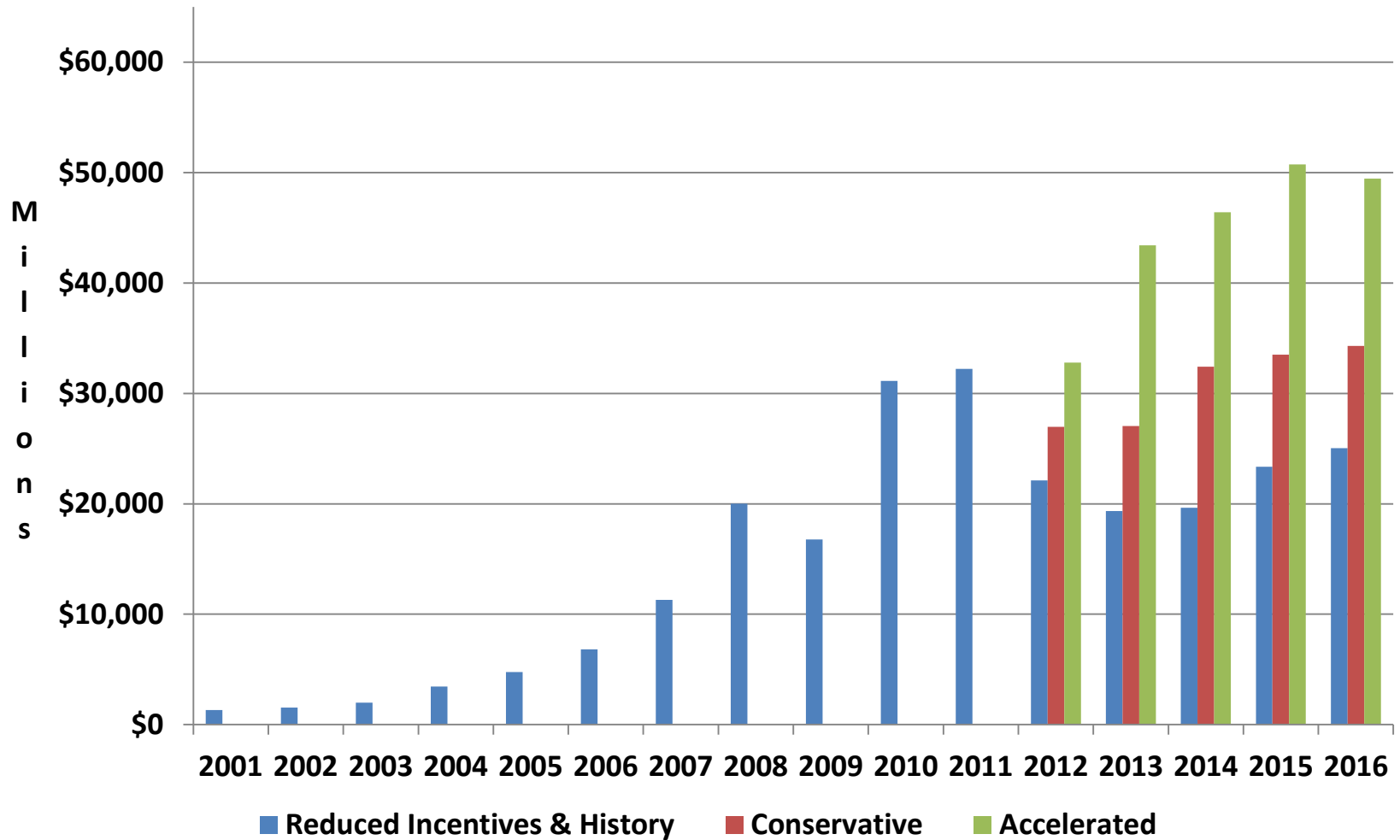
The Future

Aggregate PV Forecast to 2016



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
— History/Reduced Incentives	1984.2	3073.0	5491.8	7913.3	17402.7	23579.3	21269.5	18770.0	17863.7	19629.9	21586.3
— Conservative							24528.4	25759.0	26798.1	28145.9	29562.5
— Accelerated							31518.4	42151.3	42181.7	42633.0	46894.8

PV Technology Revenues to the first buyer 2016



Regional Forecast to 2014, Reduced Incentives, Conservative, Accelerated (PV)

Region	2010 MWp	% Chg	2011 MWp	2012		2013			2014			CAGR 2010 - 2014		
				Cons. MWp	Acc MWp	RI MWp	Cons. MWp	Acc MWp	RI MWp	Cons. MWp	Acc MWp	RI MWp	Cons %	Acc %
North America	1566.2	66%	2593.7	2943.4	3467.0	3378.6	3374.4	5058.2	3572.7	4689.7	7170.9	17%	34%	66%
Latin America	60.9	35%	82.5	98.1	126.1	206.5	334.9	447.7	178.6	750.3	843.6	31%	87%	93%
Asia-Pacific	1742.0	232%	5776.5	7009.1	9581.6	6754.0	10020.3	11705.4	6516.7	9642.1	10993.3	39%	53%	58%
Europe	13944.1	7%	14854.9	14122.3	17681.8	8111.9	11385.0	23802.0	7256.5	11046.1	21866.3	-15%	-6%	12%
Africa & The Middle East	88.8	206%	271.6	355.7	661.9	319.1	644.0	1138.1	339.1	670.0	1307.6	40%	66%	96%
Total World	17402.7	35%	23579.3	24528.4	31518.4	18770.0	25759.0	42151.3	17863.7	26798.1	42181.7	1%	11%	25%

Examples of the assumptions used for these forecasts are:

Low

- Continued pressure on PV technology prices (low)
- Unsustainably low bidding on tenders/PPAs
- Euro Zone instability
- Low Natural Gas Prices
- Retroactive changes to FiT programs increasing investor doubt

High

- Stability in pricing leading to recovery of technology sector
- Stability in tender/PPA bidding
- Lower costs leading to margin improvement
- Incentive stability
- Continued commitment in China for the domestic deployment of solar technology

Application Forecast to 2021

Application Segment	2001	2006	2011	2016		2021		CAGR 11-16		CAGR 16-21	
	MWp	MWp	MWp	Cons. MWp	ACC. MWp	Cons. MWp	ACC. MWp	Cons.	ACC	Cons.	ACC
Remote Industrial	59.6	111.1	130.9	171.1	180.2	235.5	284.9	5%	7%	7%	10%
Remote Habitation	62.4	134.1	136.5	202.4	227.9	314.2	427.3	8%	11%	9%	13%
Consumer Power	14.4	23.0	31.6	40.7	46.8	62.0	78.9	5%	8%	9%	11%
Grid-Residential	183.3	836.9	8147.2	10784.0	14627.7	16361.1	26781.2	6%	12%	9%	13%
Grid-Commercial	20.3	848.2	14897.8	18070.4	31112.9	29964.1	55718.2	4%	16%	11%	12%
Grid Utility	6.1	22.2	232.8	291.5	696.6	420.7	414.6	5%	25%	8%	-10%
Connected	209.7	1707.2	23277.8	29145.8	46437.1	46745.9	82914.0	5%	15%	10%	12%
Consumer Indoor	6.8	8.7	2.5	2.5	2.7	2.6	2.9	0%	2%	0%	1%
Total Demand	352.9	1984.2	23579.3	29562.5	46894.8	47360.1	83708.0	5%	15%	10%	12%
Grid Connected % Total	59%	86%	99%	99%	99.0%	98.7%	99.1%				

US Forecast to 2014 (PV)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	CAGR 2006- 2014
United States										
Reduced Incentives (1)	222.2	304.8	375.6	487.5	1378.4	2308.4	2297.1	3070.7	3322.6	40%
Grid Comm.	95.5	149.3	172.8	287.6	813.2	1223.5	1401.2	1903.9	2033.5	47%
Grid Utility	4.4	9.1	26.3	34.1	110.3	138.5	91.9	122.8	166.1	57%
Grid Res.	75.5	97.5	139.0	146.2	413.5	923.4	781.0	1013.3	1089.8	40%
Remote	46.7	48.8	37.6	19.5	41.4	23.1	23.0	30.7	33.2	-4%
Conservative	222.2	304.8	375.6	487.5	1378.4	2308.4	2590.2	3070.7	4408.3	45%
Grid Comm.	95.5	149.3	172.8	287.6	813.2	1223.5	1554.1	1903.9	2658.2	52%
Grid Utility	4.4	9.1	26.3	34.1	110.3	138.5	103.6	122.8	176.3	58%
Grid Res.	75.5	97.5	139.0	146.2	413.5	923.4	906.6	1013.3	1542.9	46%
Remote	46.7	48.8	37.6	19.5	41.4	23.1	25.9	30.7	30.9	-5%
Accelerated	222.2	304.8	375.6	487.5	1378.4	2308.4	3051.0	4451.2	6453.8	52%
Grid Comm.	95.5	149.3	172.8	287.6	813.2	1223.5	1739.1	2599.5	3911.0	59%
Grid Utility	4.4	9.1	26.3	34.1	110.3	138.5	152.5	267.1	322.7	71%
Grid Res.	75.5	97.5	139.0	146.2	413.5	923.4	1128.9	1557.9	2194.3	52%
Remote	46.7	48.8	37.6	19.5	41.4	23.1	30.5	26.7	25.8	-7%

Thank You!

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