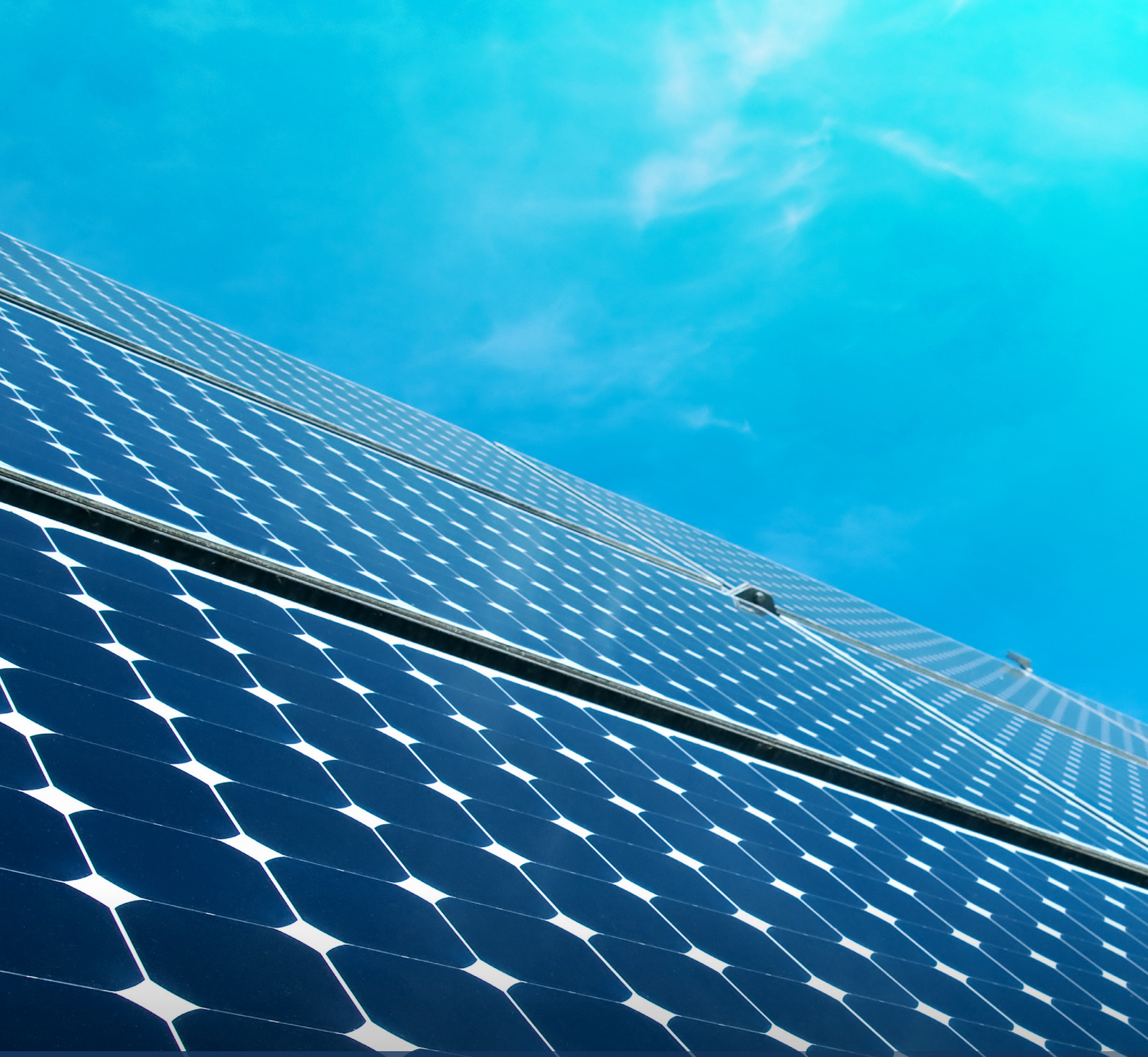


PHOTOVOLTAIC INDUSTRY

WITNESSING A PARADIGM SHIFT

Thematic Report by

Ankit Kedia, *Senior Analyst, Investment Research*

The global photovoltaic (PV) industry has evolved substantially during the last decade. Europe's dominance in the global PV industry has ended sooner than anticipated, as new 'power' centers emerged. Europe accounted for 74% of the world's new PV installations in 2011, but constituted just 29% in 2013. Although global data indicates momentum in the PV industry, it needs to be rationally analyzed to understand the fundamental changes occurring in the industry.

In today's fast-changing business environment, decision as well as timing earns dividend. Therefore, company strategists and investors in the PV industry need to re-calibrate their strategy in sync with the paradigm shift in the industry. The analysis of Europe's PV industry vis-à-vis the global PV industry may help the companies to devise their expansion/ consolidation strategies; moreover, it may help investors rationalize their corpus to fetch better returns.

Image Source: NELLIS AIR FORCE BASE website

The global PV industry is en route some fundamental changes, which would have profound implications in the near future. After over a decade of clear dominance, Europe is no longer the topmost regional PV market in the world since 2013. According to European Photovoltaic Industry Association (EPIA), Asia overtook Europe to become the largest PV market in 2013, accounting for around 56% of the global PV industry. Asia's dominance in the global PV industry occurred in parallel with Europe's decline in 2012. Despite slowdown in Europe, strong growth in non-European markets led to expansion in the global PV industry.

CHANGE IN SOVEREIGN POLICIES RESHAPING GLOBAL PV INDUSTRY

In most countries, solar PV remains a policy-driven industry. Due to substantial initial investment involved in PV installations, the demand is highly correlated with the corresponding policies of the state, which plays a critical role in driving the market over the medium to long term. To achieve their CO_2 emission reduction targets, developed and developing countries have started providing various incentives, including subsidies, tax benefits, preferential purchase, and cost sharing, to promote PV/renewable installations. Nonetheless, declining political support and gradual phasing out of some PV policies have led to reduced demand in several European countries, particularly Germany, Italy, Belgium, France, and Spain. However, the implementation of new and encouraging policies (such as feed-in tariff) has boosted the demand in other countries, such as China, Japan, and the US.

As enumerated in Table 1, major policies for the PV industry in key European PV markets (Germany & UK for illustration) are impacting negatively as the subsidy support is now gradually phasing out with the shift in sovereign focus. Earlier, the same policies led the high growth phase in these markets due to more favorable policy terms.

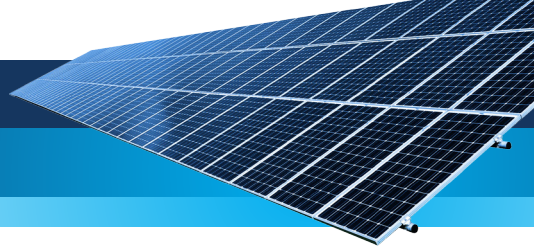


Table 1: Major Policies for the PV Industry in Key European PV Markets

Country	Policy	Impact on PV System Suppliers
UK	Renewable Obligation Certificate (Roc) Scheme The scheme requires licensed electricity suppliers in the UK to source a specified proportion of electricity from eligible renewable sources. Eligible renewable electricity producers report the amount of electricity generated to the Office of the Gas and Electricity Markets (Ofgem) and receive the ROC. To comply with the policy, suppliers buy these ROCs from producers in exchange for money. ROCs are tradable commodities with no fixed price.	As the government intends to end this scheme by March 31, 2017, all eligible installations only until this date would continue to receive full governmental support for 20 years. Thus, we expect increased number of PV installations only over the next two years, as the producers plan to avail these benefits. Once the scheme is over, we expect the demand to slow down.
	Feed-In Tariff (Fit) Scheme The FIT scheme supports small-scale (5 megawatts (MW) or less total installed capacity) systems. The eligible producer registers the installation with a licensed electricity supplier or Ofgem. The supplier pays the producer a generation tariff for any amount of electricity generated and an export tariff if any surplus electricity is exported to the grid. The suppliers recover these payments through the electricity bills of their customers.	The tariffs are revised on a quarterly basis and have been declining since 2012, as the government reduced the subsidy citing that the tariffs were providing returns higher than those originally intended (due to faster than anticipated decline in component costs). Therefore, this is expected to have a negative impact on the demand for PV systems.
Germany	Renewable Energy Act (Eeg) This act was designed to encourage cost reductions based on improved energy efficiency from economies of scale over time. It provided a significant boost to Germany's renewable energy sector. The act is similar to the FIT scheme in the UK.	FITs in Germany decline at regular intervals to exert cost pressure on energy producers and technology manufacturers. The decrease in FITs generally applies to new plants.

Source: Ofgem UK, IEA, Aranca research

However, as you will see in Table 2, similar policies for the PV industry in key Non-European PV markets (China, USA and Japan) are positively impacting due to wide subsidy support as result of sovereign focus in these countries. We expect the increasing support to result in high growth of the industry for the next couple of years.

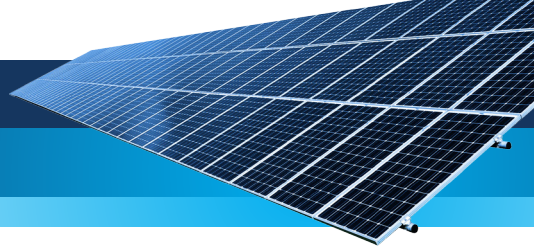


Table 2: Major Policies for the PV Industry in Key Non-European PV Markets

Country	Policy	Impact on PV System Suppliers
China	Golden Roof Program Under this program, the government provides a subsidy of $2.93 per Watt for roof-mounted solar PV systems over 50 kW, which covers over 50% of a system's installation cost.	This program is expected to encourage more PV installations in China at the individual level, resulting in high demand for PV systems.
	Golden Sun Program This program is applicable to projects with a capacity of 300 MW or more. It covers up to 50% of project costs (including transmission or distribution lines to connect to the grid) and up to 70% of such costs for projects in remote areas (such as the Western region).	This program would encourage increased PV installations in China at the supplier level, resulting in high demand for PV systems in the country.
	Fit Scheme In China, FIT was initiated in 2011 for ground-based and utility type systems, which was later extended to distributed generation systems, including rooftop systems. The installations receive subsidies of $0.14–0.16 per kWh based on the type.	Although the tariffs have been reduced a few times, the eligibility base has also been widened to offset the negative impact of lower tariffs.
	Others Government offers several other incentives such as preferential loans, subsidized interest rates, mandatory grid connection, and mandatory purchase of electricity from licensed renewable energy producers.	China is one of the fastest growing markets for PV installations. The government's supportive policy has resulted in strong growth in PV installations.
USA	Investment Tax Credit (Itc) Scheme This scheme allows businesses to invest in PV projects and receive a tax credit for up to 30% of the expense until 2016 and removed the prohibition against a utility company's use of the ITC, thereby allowing these companies to take advantage of the credit.	As the extension is about to end in 2 years and a status quo is not certain, the US PV industry has started to witness rapid growth in installations to become the fastest growing market after China.
Japan	FIT scheme The scheme provides a fixed amount of tariff for PV-based electricity generated by household/ non-household customers in Japan. The projects receive benefits under this scheme for a period of 20 years. The electricity suppliers collect FIT as a surcharge from their customers.	Although the tariffs have been reduced a few times, it has limited impact, as Japan still offers the highest prices (nearly double the global average) for PV systems.

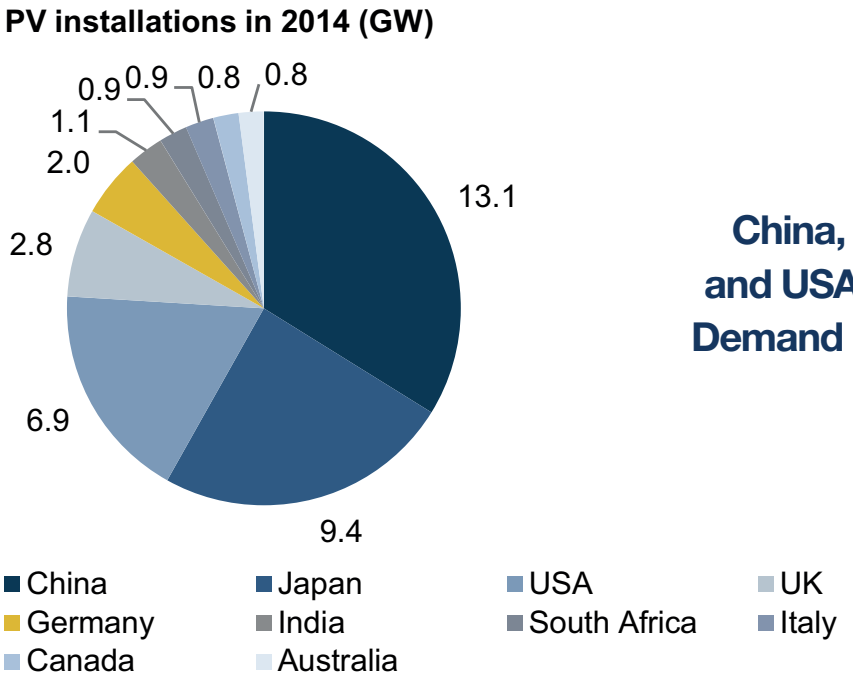
Source: Congressional Research Services, METI Japan, Aranca research

RISING DOMINANCE OF CHINA, JAPAN, AND THE US IN GLOBAL PV INDUSTRY

With the PV industry under transition, the demand pattern is shifting from European countries to non-European countries. China, Japan, and the US are together expected to account for over 60% of the global demand for PV installations in 2015, led by government incentives and declining cost of systems. However, gradual reduction in subsidies and state incentives in European countries is expected to result in lower demand, excluding the UK.

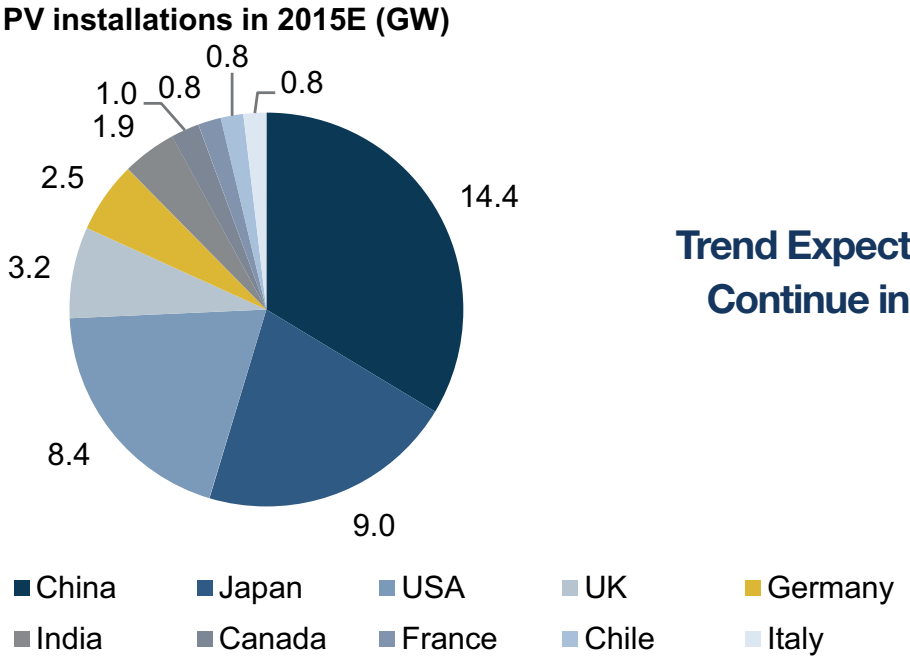
In 2013-2014, growth in the global PV industry was largely driven by Asian countries, particularly China and Japan, which are currently the largest and second-largest PV markets, respectively. The markets in the Americas expanded at a lower rate as compared with China/Japan, but significant growth was observed in the US. In other regions such as the Middle-East and Africa, interest in PV installations is yet to translate into a meaningful market.

Non-European Countries Accounted For Most New PV Installations



China, Japan, and USA Drove Demand in 2014

Source: IHS, Aranca research



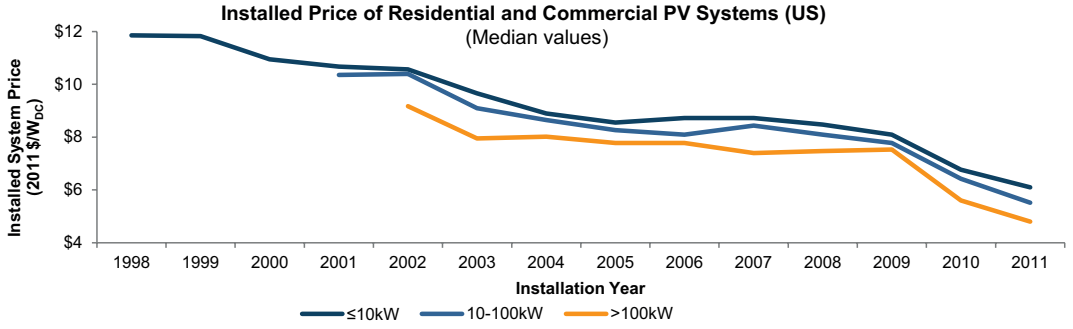
Trend Expected to Continue in 2015

Source: IHS, Aranca research

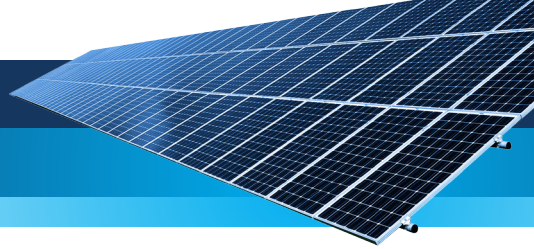
GROWING COMPETITIVENESS OF PV IN ELECTRICITY SECTOR

For the third consecutive year, according to EPIA, PV was one of the two most installed sources of electricity in the European Union (EU) in 2013. The PV industry in Europe and globally continued to improve its competitiveness vis-à-vis other industries in the electricity sector, led by a significant decline in the cost of PV systems and rising electricity prices. The savings in electricity cost and/or revenues generated by selling PV electricity are converging with (or even higher in some cases) the long-term cost of installing and financing a PV system.

Prices of residential and commercial PV systems in USA have declined by more than 60% over the last 15 years



Source: US DoE, Aranca research



The levelized cost of electricity (LCoE) is an industry matrix that is widely used to assess the relative viability of different electricity generation methods.

The LCoE for PV systems is nearing the LCoE for coal and natural gas, the two most popular sources of producing electricity.

With a declining LCoE, the demand for PV systems could be partially driven by self-consumption rather than just FITs or similar support schemes.

Table 3: Comparison of LCoE for Different Types of Power Plants

Power Plant Type	Cost ($/kWh)	Power Plant Type	Cost ($/kWh)
Coal	0.10–0.14	Solar PV	0.13
Natural Gas	0.07–0.13	Solar Thermal	0.24
Nuclear	0.10	Geothermal	0.05
Wind	0.08–0.20	Biomass	0.10
Hydro	0.08		

Source: US DoE, Aranca research

The decline in LCoE for solar power is essentially due to intense competition, technological improvement, economies of scale, and state subsidies in various forms.

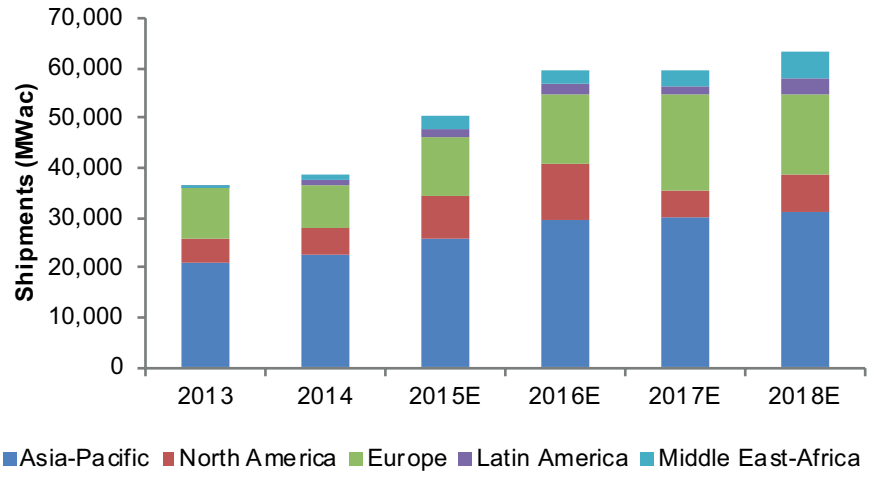
Moreover, the LCoE for dispatchable fuel-based systems, such as coal and gas, depends on prevailing fuel prices and exhibits an increasing long-term trend, unlike non-dispatchable fuel-based systems such as solar.

In general, solar systems exhibit a declining long-term trend with advancement in technology and scale of production.

Demand Expected to Rise After Weak 2014

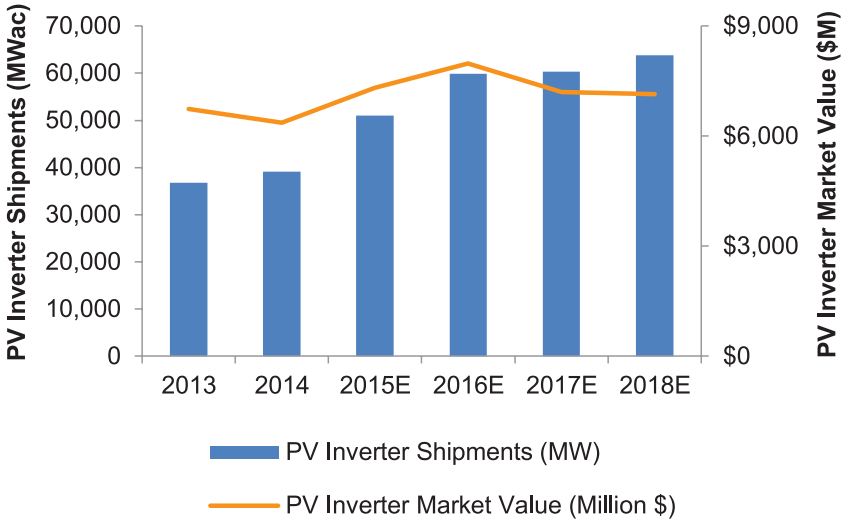
The global PV industry is becoming more geographically diverse; this offers demand opportunities in emerging PV markets to offset weak demand in matured markets. We expect the US, China, and Japan to fuel demand growth over the next two to three years, which would compensate for the declining demand in European markets. Global PV shipments are estimated to reach about 50 GW in 2015 compared with 40G W in 2014. The industry is expected to witness high growth in demand in the near term, as the need for a wide scope of services increases and rising demand from new markets with weak grids creates the need for more flexible architectures.

Demand to Shift from Europe to USA and APAC

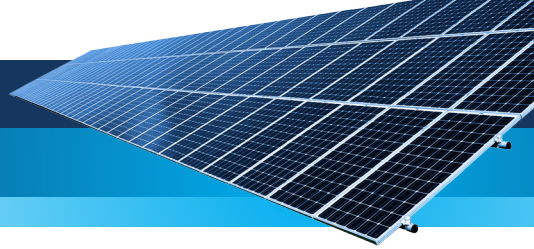


Source: GTM research, Aranca research

PV Inverter Market Value to Stabilize with Demand



Source: GTM research, Aranca research



M&A Activities Expected to Rise as Companies Look For Consolidation/Market Penetration

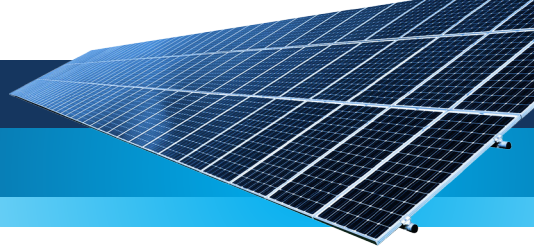
In mature PV markets, falling prices and rising competition in the PV industry is forcing the established players to rationalize their assets by way of mergers & acquisitions (M&A). The European players are acquiring more synergistic assets and, at the same time, getting rid of not-so-fit ones. In growing PV markets such as the US, Japan and China, the M&A in PV industry is more aligned with the strategy of market entry or market penetration. We expect the improvement in demand outlook to result in increased number of M&A activities in the PV space over next two years.

Table 4: List of Recent M&A Deals in PV Industry

Effective Date	Acquiror		Target*		Deal Status
	Company	Nationality	Company	Nationality	
28/07/2015	SUNPOWER	USA	infigen US solar Projects	USA	Completed
20/07/2015	SUNPOWER	USA		Philippines	Announced
16/04/2015	SOUTHERN COMPANY	USA	First Solar - 32MW PP	USA	Completed
31/03/2015	CanadianSolar	Canada	RECURRENT ENERGY	USA	Completed
10/02/2015	enphase	USA	NEXT PHASE SOLAR	USA	Completed
06/02/2015	Hanwha Solar	China	Hanwha Q CELLS	Germany	Completed
10/12/2014	First Solar	USA	Clean Energy COLLECTIVE	USA	Completed
10/11/2014	SUNPOWER	USA	SOLARBRIDGE TECHNOLOGIES	USA	Completed
04/11/2014	SMA	Germany	phoenix SOLAR	Germany	Completed
23/09/2014	SolarCity	USA	silevo	USA	Completed
04/08/2014	Advanced Energy	USA	ULTRAVOLT	USA	Completed
20/06/2014	bel	USA	power-one	USA	Completed
03/06/2014	First Solar	USA	skytron	Germany	Completed
28/05/2014	Danfoss	Germany	SMA	Germany	Completed
14/04/2014	Advanced Energy	USA	HiTek Power	UK	Completed
26/02/2014	SMA	Germany	Danfoss Solar Inverter Business	Germany	Completed
27/01/2014	Advanced Energy	Germany	AEG perfekt in form und funktion	Germany	Completed

Source: Reuters

**may include acquisition of subsidiary / equity stake*



Expect Large Swings in Profits to Make Current Valuations Attractive

Pricing pressure and weak demand had previously resulted in subdued earnings for most of the players in the industry. Hereon, we expect considerable growth in earnings with the improvement in demand outlook and expansion in operating margins as a result of technological advancements and operating leverage. The expected swing in profits is not yet completely reflected in the share prices of companies which make their current valuation attractive.

Table 5: Operational Performance Forecast of Listed Companies in PV Industry

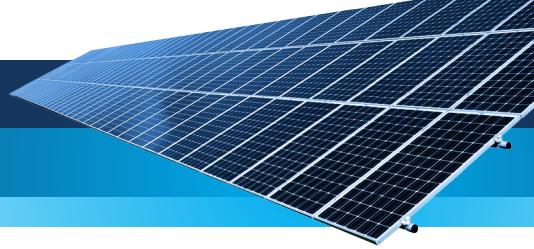
Company	Currency	Sales (mn)		EBITDA (mn)		Net Income (mn)		Book Value (per share)	
		2015E	2016E	2015E	2016E	2015E	2016E	2015E	2016E
SMA Solar Technology AG	EUR	876.3	919.9	66.0	122.0	(3.7)	41.8	16.0	17.5
Advanced Energy Industries Inc	USD	521.1	426.9	83.2	134.3	84.0	97.4	5.5	6.8
Enphase Energy Inc	USD	406.2	490.7	9.7	30.6	3.6	21.9	1.4	1.6
First Solar Inc	USD	3,557.1	4,053.4	590.2	672.6	298.0	396.0	52.7	55.7
SolarCity Corp	USD	410.5	736.4	(443.0)	(367.4)	(526.7)	(611.6)	10.8	14.0
SunPower Corp	USD	2,269.3	2,738.7	431.8	446.2	251.2	273.7	11.2	12.1
ABB Ltd	USD	35,181.4	35,779.6	4,726.4	5,071.2	2,281.2	2,602.3	6.7	6.8
Sungrow Power Supply Co Ltd	CNY	5,408.0	7,877.0	650.7	979.0	551.1	779.5	4.3	5.4
Canadian Solar Inc	USD	2,885.7	3,014.7	333.1	496.7	140.8	196.9	15.1	19.6

Source: Reuters (as on October 13, 2015)

Table 6: Valuation Multiples of Listed Companies in PV Industry

Company	Currency	EV/Sales (x)		EV/EBITDA (x)		P/E (x)		P/B (x)	
		2015E	2016E	2015E	2016E	2015E	2016E	2015E	2016E
SMA Solar Technology AG	EUR	1.3x	1.2x	17.0x	9.2x	NM	31.5x	2.4x	2.2x
Advanced Energy Industries Inc	USD	1.8x	2.2x	11.5x	7.1x	13.5x	11.7x	5.0x	4.1x
Enphase Energy Inc	USD	0.5x	0.4x	21.7x	6.9x	62.4x	10.3x	3.8x	3.1x
First Solar Inc	USD	1.0x	0.9x	6.2x	5.4x	17.2x	13.0x	1.0x	0.9x
SunPower Corp	USD	1.7x	1.4x	8.8x	8.5x	13.4x	12.3x	2.2x	2.0x
ABB Ltd	USD	1.3x	1.3x	9.9x	9.2x	18.3x	16.1x	2.7x	2.7x
Sungrow Power Supply Co Ltd	CNY	3.2x	2.2x	26.7x	17.7x	31.7x	22.4x	6.2x	4.9x
Canadian Solar Inc	USD	0.8x	0.7x	6.6x	4.4x	8.0x	5.8x	1.4x	1.1x

Source: Aranca research, Reuters (as on October 13, 2015)



CONCLUSION

After several years of policy-driven high growth, the global PV industry is witnessing a shift in market dynamics and geographical focus. Declining political support in Europe has created uncertainty regarding the policies related to the PV industry, hampering its re-development. However, outside Europe, the growth potential seems promising, as increasing demand in several countries could convert into high growth for the industry.

As the potential of PV based power and its benefits for the world are becoming more relevant and feasible than ever, PV systems are being increasingly used within the electricity generation system. Undoubtedly, PV's share in the global energy mix would continue to increase. We can infer the following points:

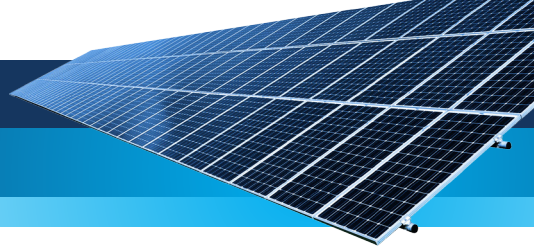
Europe's PV industry is converging toward a more fundamentally sustainable demand environment from an initial phase of high growth, propelled by sovereign support.

Due to the substantial price declines in recent years, PV systems are now broadly recognized as a reliable, cost competitive and sustainable energy source. Therefore, the PV industry should be considered and looked upon as a low-risk investment for the financial community.

Though, the PV industry is gradually moving towards a self-sustainable demand, its fortunes are still significantly hinged on political support and regulatory framework.

As the PV industry's focus shifted to China, Japan, and the US from the EU, we could witness increased M&A activities in the EU, as companies try to explore new markets and consolidate their market share. Moreover, companies in these growing markets are better placed due to their local advantage to gain from the rise in demand compared with their European counterparts.

Key issues expected to play an important role in determining further market evolution include state policies, competitiveness of PV in the power sector, and industry consolidation.



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