Solar PV to top 652GW by 2025—Perry Sioshansi's Letter from America

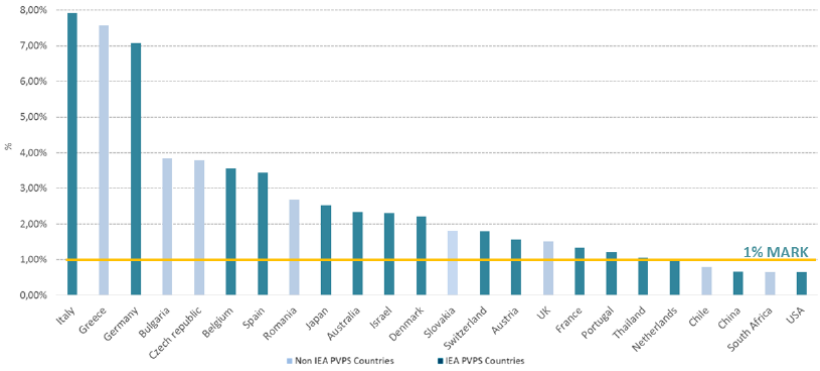
Solar PV shows growth potential especially in emerging markets.

Solar photovoltaics (PV) continue to show promise with falling costs and increased penetration in a number of key markets. The latest release of the International Energy Agency's (IEA) *Photovoltaic Power System Program* (PVPS), says some 20 countries already get more than 1% of their electricity needs from solar PVs, with more likely to cross the threshold in the coming years (*graph on right*).

Italy, Greece and Germany are in the 7+% range—delivering far more than this on certain sunny days, especially on weekends when overall demand is low.

According to the IEA, nearly 39GW of solar PV was installed in 2014, with China, Japan and the US on top, while Germany, China and Japan had the most cumulative installed solar PV capacity (*tables below*).

More countries to cross the 1% threshold 2014 theoretical PV production



Source: International Energy Agency

Another report by GlobalData predicts that solar PV capacity will top 652GW by 2025. This following an impressive growth period during 2006-14, which saw a compound annual growth rate (CAGR) of over 50%, when cumulative PV installed capacity increased from 5.7GW to an estimated 174GW.

China adds more

	TOP 10 COUNTRIES IN 2014 FOR ANNUAL INSTALLED CAPACITY		TOP 10 COUNTRIES IN 2014 FOR CUMULATIVE INSTALLED CAPACITY	
1st	China	10,6 GW	Germany	38,2 GW
2nd	Japan	9,7 GW	China	28,1 GW
3rd	USA	6,2 GW	Japan	23,3 GW
4th	UK	2,3 GW	Italy	18,5 GW
5th	Germany	1,9 GW	USA	18,3 GW
6th	France	0,9 GW	France	5,7 GW
7th	Australia	0,9 GW	Spain	5,4 GW
8th	Korea	0,9 GW	UK	5,1 GW
9th	South Africa	0,8 GW	Australia	4,1 GW
10th	India	0,6 GW	Belgium	3,1 GW

Source: International Energy Agency

The underlying reasons for the phenomenal growth? "[…] increasing economies of scale, emerging technologies, and policy-based government and institutional industry support", according to GlobalData. IEA puts the 2014 number at 177GW, reassuringly close.

China and Japan were responsible for much of 2014's growth, while other countries, notably in Europe, began to reduce or remove subsidies.

Despite the dwindling support in Europe, GlobalData expects increased PV installations in other developing nations with PV installed capacity growing at a CAGR of 12.8% through 2025. It said annual installations will stabilise in the range of 39.3-46.5GW by 2025. At these rates, global solar PV installed capacity can be expected to rise by 177% from 2014 levels by 2019—reaching around 500GW.

While the rate of growth in Europe is not growing as fast as it once did, the Asia Pacific region shows tremendous growth potential (see *graph next page*). To put these numbers in perspective, global installed wind capacity at the end of 2014 was around 372GW, 337GW for nuclear power. While everyone recognises that the sun does not shine and wind does not blow continuously, the sheer amount of installed solar PVs is nothing short of astonishing, especially recognising that not much existed prior to 2000. If wind and solar continue to grow at rates anywhere near the recent past, they will soon dwarf nuclear generation despite relatively low capacity factors.

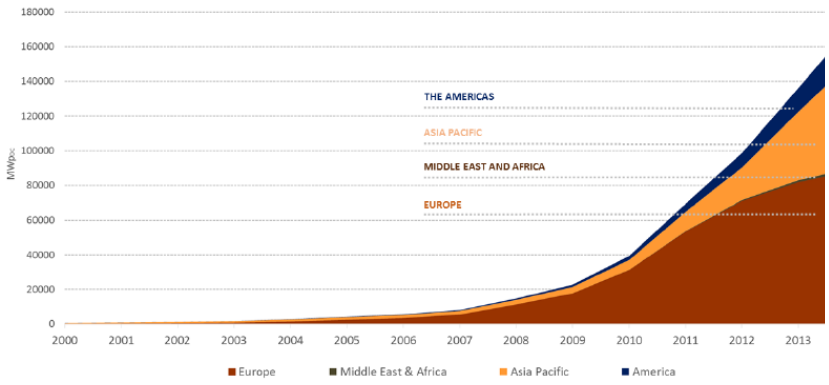
Those who say that not much changes in the energy system and/or it changes ever so slowly may be in denial or anchored to historical rates of change. It took decades for telephone to reach high global penetration levels—Apple's iPhone and similar smart phones reached astonishing penetration levels even in places where there is no electricity in short time.

Referring to technological changes in the energy sector in an opinion piece titled "The Power Revolutions" on 21 August 2015 issue of *The Wall Street Journal*, Daniel Yergin of IHS, a consultancy, acknowledges that change is coming but comforts his constituents—mostly fossil fuel companies—that change will be *gradual*. He writes: "Such energy transitions are nothing new. They have been going on for more than two centuries. They have been transformative and undoubtedly will be again—but if history teaches anything, it is that they don't happen fast."

Yergin offers multiples of examples from the past suggesting that change take place slowly, not years or decades but much longer: "The modern oil industry began in 1859, but it took more than a century for oil to eclipse coal as the world's No. 1 source."

Moreover, he notes: "A no less important lesson is that, even as newer sources overtake older ones, they also overlay them; the older hardly go away. Oil may have overtaken coal as the world's top energy source in the 1960s, but since then, global coal consumption has tripled." He adds: "Previous transitions have occurred because of new technology and applications, changing costs and prices, and concerns about energy security. Today it is climate-change policy that is pushing the transition, seeking to replace lower-cost energy with what is, at least for now, higher-cost energy. The cost gap is currently being closed by a host of subsidies, incentives and regulations and by advances in technology and manufacturing."

Faster growth in Asia pacific



Source: International Energy Agency

Looking at the more recent energy revolutions, Yergin highlights two: "Two big innovations are now playing out across this new energy landscape. One of them is renewable: solar energy. The other is conventional: shale gas and shale oil."

Yet Yergin's concluding message is a rhetorical question followed by what appears to be his answer: "What innovation will power the next revolution in human civilization? It may well be something, as Bill Gates suggests, that we can't see clearly now. But when the breakthrough occurs, the chances are that it will have been 20, 30 or even 40 years in the making. Or maybe longer."

As this writer sees it, the recent evidence suggests that the pace of change in the energy space has greatly accelerated to the point that the opposite may be true. And should Paris succeed in providing a vision towards a low-carbon future, the pace of change will further accelerate.

While many in the fossil fuel sector find comfort in Yergin's message, others may decide that the time has arrived to go back to the drawing board.

Perry Sioshansi is a specialist in electricity sector restructuring. He is founder and president of Menlo Energy Economics and is the editor and publisher of *EEnergy Informer*, from which we have sourced this article, and which we commend.

As part of our Tomorrow's Utilities customer event in London last Tuesday, we co-hosted, alongside Perry, a session in the morning that examined how technological developments were transforming the European utilities sector. The event looked particularly at some of the key drivers of change in the sector, and how this might impact upon the future development of business models.

The event was tied to a book, to be published by Perry early next year, on *The Future of Utilities: Utilities of the Future*.

Slides from the session can be downloaded here.