

The hungry dragon: explaining China's 50GW+ PV market in 2017

China | In 2017 China's domestic PV market surpassed 50GW. Meishi Tan asks whether such astonishing levels of deployment can be sustained and, if so, what the future drivers of growth will be



Credit GCL

At the beginning of 2017, the big question regarding solar in China was whether the stunning ~35GW performance of 2016 could be repeated. Yet, over the course of the year, the question transformed, quite surreally, to whether China would hit the 50GW mark in 2017 – essentially, the sum total installation of the rest of the world combined. The Chinese National Energy Administration (NEA) official figures eventually put 2017 new-built capacity at 53.06GW.

In this article, we will address some questions that have been on everybody's mind, namely: what exactly is causing the growth surge? With such rapid growth, are the economics of China PV projects today compromised? What could sustain this gargantuan, feed-in tariff-fattened domestic industry in 2018 and beyond? Is 50GW+ the new normal?

What drove the 2017 surge?

To give some context for the discussion, we can characterise the Chinese PV market in 2017 as having four key segments with

distinct growth drivers, approximately broken down as shown in Figure 1 and explained as follows:

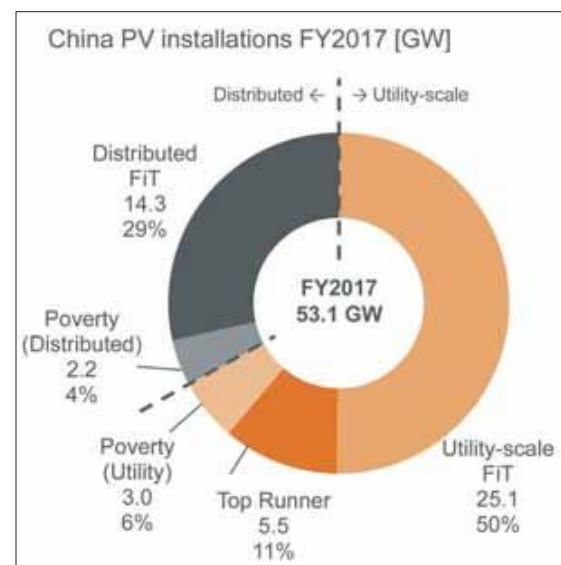
Utility-Scale FIT: Pure commercial utility projects that before 2016 made up almost all of the domestic market. Projects in 1H 2017 receive 2016 FIT tariff rates and projects in 2H 2017 receive lower 2017 tariffs; annual new build capacity is theoretically capped by annual "Build Plans" issued by the NEA, but in practice many states fill the FIT quotas on a first-completed-first-served basis, leading to massive overbuild, particularly in June, the month before the deadline.

Top Runner programme (target 5.5GW). Competitively tendered projects utilising

Figure 1. China PV installations FY2017 (GW). Source: National Energy Administration (NEA), local news reporting, Apricum analysis. Note that there are no official numbers available for exactly how much has been installed under the Poverty Alleviation and Top Runner programmes – the figure shows the maximum allocated under the respective programmes

China's domestic solar industry looks set to remain the bellwether for global PV trends

modules and inverters that fulfill more stringent Top Runner performance requirements – Round 2 was awarded in 2016 and slated for completion mostly by September 2017, but many were delayed. Price makes up only ~30% of the evaluation criteria and



any excess over the local wholesale rate is still subsidised by the government.

Poverty Alleviation programme

(target 5.2GW). Utility-, village- and household-scale projects to specifically benefit households with no employment ability, including the disabled. Projects are funded by debt from state banks and equity from state social support funds and private investors. Regarding how the “poverty alleviation” works, for utility- and village-scale projects, dividends accruing to the state-funded equity share are distributed amongst households over the project lifetime, approximately CNY3,000 (US\$465) per year; for residential projects, households simply receive the installations for free.

Distributed FIT. FIT-supported projects under 20MW that have priority over larger utility-scale projects in receiving FIT disbursements; new build capacity is not capped under the Build Plan and segment is thus heavily exploited by utility-scale developers building ground-mount projects under the 20MW limit.

As evident from Figure 1, despite expansion of the Top Runner and Poverty Alleviation programmes in 2017, and the growing awareness of such in the international community, both segments in reality contribute only a small percentage of the annual demand. Of the 5.5GW planned for the Top Runner programme, reportedly only ~2GW had been completed as of October 2017, despite the deadline being 30 September for most projects. Progress on the 5.2GW Poverty Alleviation programme allocated in 2016 is likewise slow: while statistics are not published on a national level, Henan province, for example, had completed only 35% of their

target as of October 2017, and Gansu only 44%.

The 2017 market is thus still primarily driven by pure-commercial utility-scale (>20MW) FIT projects. Subtracting the Top Runner and utility-scale Poverty Alleviation maximum capacity allocated from the 33.6GW total utility-scale projects built in FY2017, we estimate the volume of pure-commercial utility-scale FIT projects to be 25.1GW, making up half of the installed capacity.

To fathom why such massive volumes are being installed in China but not elsewhere in the world, recall that projects in 1H 2017 were installed at 2016 FIT rates of CNY0.80–0.98/kWh (US\$0.12–0.15) at locations with solar irradiation upward of 1,300–1,600kWh/m² (equivalent to e.g., Brazil); projects in 2H 2017 were installed at stepped-down, but still very healthy, 2017 FIT rates of CNY0.65–0.85/kWh (US\$0.10–0.13). On top of this generous national support, many regions still offer further province-level and city/local-level incentives in the forms of tariff increment or investment subsidies. If there are any questions about how Chinese component manufacturers are able to so easily outcompete international counterparts, one may look to see if margins in their home market are in fact supporting their overseas growth.

But while vanilla utility-scale FIT projects may be the workhorse of the industry, the dark horse of 2017 is distributed FIT. According to NEA statistics, by and large the Chinese solar market behaved in line with expectations for the first half of 2017, with June seeing the same installation rush as last year from the FIT deadline. But whereas Q3 last year saw a deep market

slump as the pipeline emptied, Q3 2017 exceeded the Q2 peak, driven by a spillover from the 30 June 30 utility-scale FIT rush and the – literally – exponential growth of the distributed PV segment.

Although distributed PV amounted to only 4.2GW in the full year of 2016, the market grew more than 4.5 times to 19.4GW in 2017. Distributed PV FIT, unlike utility-scale FIT, is not subject to any (however weak) caps by regulators, and thus developers have *carte blanche* to develop as many projects as they can – the incentive is even greater when considering that in some regions and consumption models distributed projects enjoy higher remuneration rates, and that distributed projects have priority over utility-scale FIT in receiving the oft-delayed FIT disbursements. (“Distributed PV” in fact turns out to be a misnomer, as developers are using this scheme to build 20MW projects en masse, which would be classified as utility-scale anywhere else in the world.)

What are the economics of PV projects in China today?

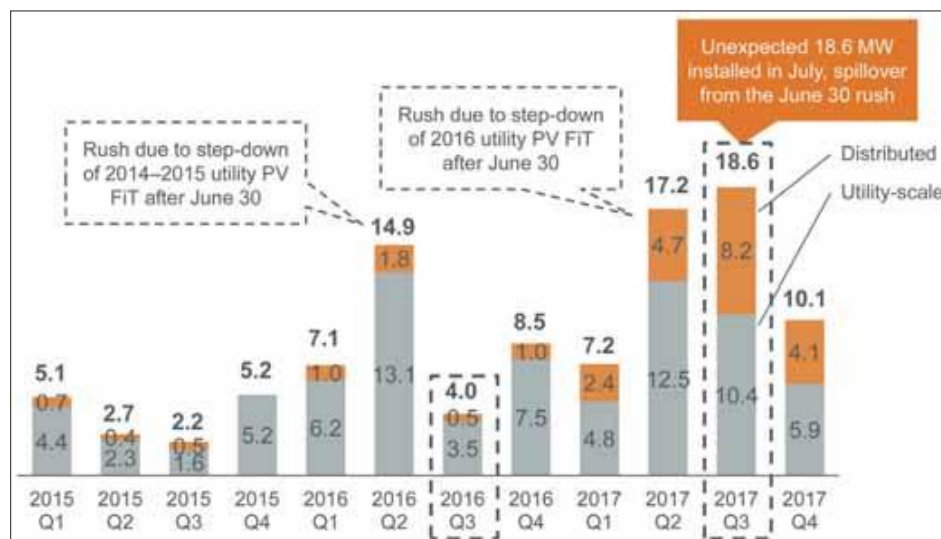
On 22 December 2017, the NEA announced the 2018 FIT rates, which incorporated a cut to both the utility-scale and distributed PV rates. Although the utility-scale FIT is typically cut every year, this would be the first cut to the distributed PV FIT rate since it was announced in 2014.

Utility-scale projects under the 2018 FIT (to be built presumably before June 2019) will receive between US\$0.10–0.13/kWh – an embarrassment of riches in today’s global PV market. However, the cash flow for the first few project years is subject to risk, as there have been significant delays in the disbursement of the FIT subsidy as the state Renewable Energy Subsidy Fund is severely backlogged to the tune of CNY60 billion as of end-2016. Projects currently backlogged receive only the wholesale rate and not the tariff subsidy.

The remuneration model for distributed PV projects is slightly more complicated. There are two possible models: “net metering” and “100% feed-in”.

Under the net metering model, only the portion of the electricity not consumed onsite is sold to the grid at a rate of CNY0.42/kWh + a “air pollution pass-through tariff” rate, which is levied onto consumers on a per kWh basis for treatment of sulphur and other pollutants generated by conventional coal. A commercial PV installation in Hangzhou city in Zhejiang province in 2018, for

Figure 2. China PV installations breakdown by utility/distributed. Source: NEA, Apricum analysis



[tariff/kWh]	Region ^a	2018		2017		Small-scale ^c PA projects will continue to receive 2017 FIT
		CNY	USD ^c	CNY	USD ^c	
Utility-scale	I	0.55	8.59	0.65	10.15	
	II	0.65	10.15	0.75	11.71	
	III	0.75	11.71	0.85	13.28	
Distributed		0.37	5.78 ^b	0.42	6.56 ^b	

example, would receive 0.37 (national FIT) + 0.4153 (air pollution pass-through tariff) + 0.10 (provincial FIT) + 0.10 (city FIT for first five years) = CNY0.985/kWh, or 15.5 US dollar cents/kWh for the portion sold to the grid.

The remuneration model for the 100% feed-in model was more complex previously but from 2018 onwards this was simplified, and they would be remunerated like a commercial utility-scale PV plant.

Village- and household-scale poverty alleviation projects will continue to receive 2017 FIT rates, evidence of the strong political support for the programme.

The million-dollar questions: will China be able to sustain an annual 50 GW+ market? What drives the future of China PV?

A study published by the China National Renewable Energy Centre (CNREC) in November 2017 recommended that China raise its official 2020 PV installation target from the current 105GW – already surpassed – to 200GW. Assuming that China reached 130-140GW at the end of 2017, this target translates into an average of 23-30GW of annual new build, or in other words, a collapse of the domestic solar industry as it currently stands.

From an economic stability point of view, and considering that PV is one of very few “technology of the future” industries in which China leads globally, a position it very much wishes to be in, there is little chance that regulators would allow a drastic slowdown of the domestic PV industry. As such the relevance of such excessively low targets to mid-term China/global PV demand should be viewed with a healthy dose of scepticism [1].

So, will China be able to sustain growth at 50GW a year? While this figure may seem unreasonably high, it has to be put in the context of China's gargantuan power demand. The 13th Power Five-Year Plan targets total installed power capacity of

2,000GW (including renewables). If the PV market sustains growth at 50GW/year over the next three years, it would put PV at ~300GW, or 15% capacity penetration. While this is not exceptionally high in comparison to other industrialised countries (e.g., Germany 20%, or Italy 16%, in 2015), the ability of the grid to absorb this level of variability differs vastly across regions, favouring of course installations closer to population-dense demand centres.

We do believe that 50GW per year is sustainable, at least in the mid-term, and that this would increasingly be driven by the distributed PV segment. We see three key risks that may inhibit PV growth: land scarcity, curtailment risks and the inability of the increasingly-burdened Renewable Energy Fund to pay out the promised FIT – for all three of these risks, distributed PV has the clear upper hand over utility-scale installations. Distributed PV has the distinct advantage of utilising smaller pockets of land, which are more readily available than large land parcels; being built closer to demand centres – as installations shifted east this year, the overall national curtailment rate in the first nine months of 2017 has actually declined 3.8% year on year; and a potential to soon access more diversified sources of compensation via private PPAs.

Furthermore, from where the industry currently stands, we observe several emerging trends that will be highly relevant as market drivers of the Chinese solar industry for the remainder of the 13th Five-Year Plan period:

- The Top Runner programme expands, raises requirements: the 2017-2020 Build Plan by the NEA upsized the Top Runner programme to 8GW/year while at the same time extending the completion period to three years. When the results for Round 3 were released in early December, however, the NEA had

Table 1. China 2018 FIT rate cut, assumed exchange rate of US\$1 = CNY6.40. a) solar resource region; b) distributed PV FIT is supplemented by other tariffs; c) meaning household (~5-7kW) and village-scale (~300kW). Source: National Energy Administration (NEA)

only approved 6.5GW for 2017, consisting of 10 x 500MW so-called “Application Bases” and 3 x 500MW “Technical Bases” [2], with different technical requirements for module efficiency and commissioning deadlines as shown in Figure 2. The prevailing sentiment is that the Top Runner programme is the lynchpin to achieving the greater objective of national PV grid parity by 2020. Thus the announcement of the 8 GW/year plan cements the Top Runner as a contiguous, sizeable programme and sends a strong signal to domestic players to continue the flurry of investments today into cutting edge R&D as well as high-efficiency production lines – application bases would provide the long-term market through, presumably, 2023 for the “new normal” of mass-market upgrades like PERC, while technical bases would ensure demand for the truly cutting-edge technology.

- Poverty Alleviation programme is integrated into the mainstream FIT, becomes a key part of ensuring popular support for PV domestically: instead of a separate programme like the 5.2GW allocated in 2016, the 2017-2020 Build Plan announced that utility-scale FIT projects from 2017 onwards would automatically prioritise poverty alleviation projects in the selection and disbursement of subsidies. Thus far, 12 provinces have either mandatorily or

Table 2. Top Runner programme minimum efficiency requirements 2018

	Module efficiency		Cell efficiency		Deadline
	Multi	Mono	Multi	Mono	
Application bases	17.0%	17.8%	19.3%	20.5%	31 Dec 2018
Technical bases	18.0%	18.9%	20.3%	21.6%	30 Jun 2019

Source: NEA

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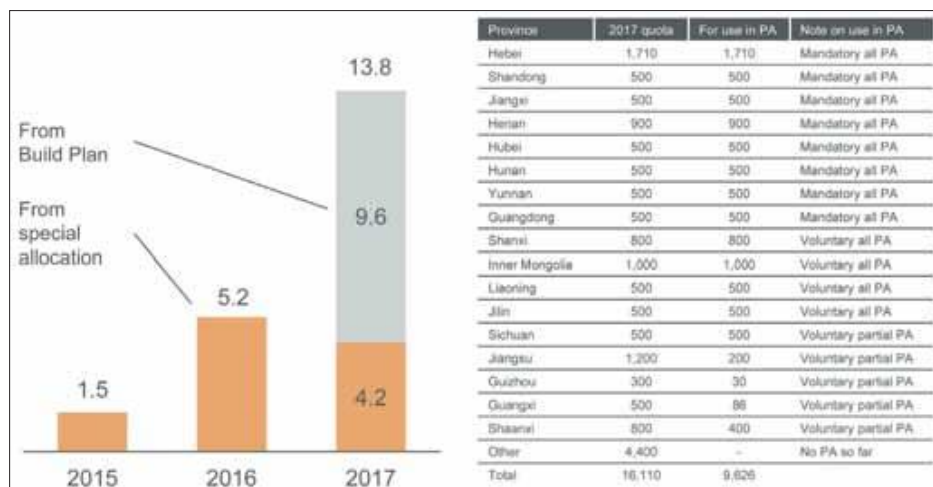


Figure 3. Poverty Alleviation projects capacity allocation breakdown (GW). Source: NEA, local news reporting, Apricum analysis

voluntarily allocated the full amount of their 2017 Build Plan towards PA projects, and five provinces partially – this implies that of the 16.1GW utility-scale FIT projects to be constructed before 30 June 2018, 9.6GW will be for the purpose of poverty alleviation. The Poverty Alleviation programme is thus intended to become a core pillar of the PV industry, supporting both PV demand and ensuring popular political support.

- Margin squeeze as industry moves from subsidy to market-based pricing: Regulators have time and again reiterated their focus on reducing the cost of solar. The industry today in all four market segments highlighted is still almost entirely reliant on tariff subsidies. The competitive bidding implemented in the Top Runner programme today and in some select provinces are mostly still cases of bidding down the subsidy. Margin decreases at home have already pushed tier-one Chinese companies to expand aggressively abroad; greater margin squeeze means we will be seeing more international activities also from tier-two players. Industry consolidation may accelerate, but this will be moderated to some extent by smaller companies leveraging local content requirements in various provinces.
- Distributed PV to serve liberalised power market: On 31 October 2017, the NRDC and NEA announced plans to set up pilot programmes allowing distributed PV facilities to sell to nearby electricity consumers; such distributed projects will continue to enjoy FIT and priority in receiving FIT disbursements. "Distributed" PV here is also even more loosely defined to also include projects between 20-50MW under 110kV. These

pilot programmes are to end, and actual implementation to begin, as early as June 30, 2018. While the surge in distributed PV may moderate after the FIT incentive is slashed, the liberalisation of the market means that private PPAs may become another demand driver in the near future – a key trend to watch.

- Green certificates pilot programme to replace FIT? In July this year, China issued its first batch of green power trading certificates to 20 pilot projects, to be available for purchase on a voluntary basis. Projects that receive green certificates would no longer benefit from FIT. As of October 2017, however, reception has been poor, with only 12,000 out of the 8 million issued certificates sold (or 0.15%; 90% sold to businesses, 10% to individuals). The government has however communicated the intention to implement mandatory green certificate purchase for certain industries as early as 2018 – another key trend to watch

Conclusion

In conclusion, we reiterate the importance of watching Chinese PV policies as one of the earliest predictors of short- to mid-term global PV trends, no matter whether in demand, prices, or technology.

On prices, for example, there are now some local news outlets reporting that from 2019 onwards, the NEA would no longer give utility FIT projects the half-year build time extension to June of the following year, which if true would mean global PV prices would no longer see the 2Q peak and 3Q plunge that has been the trend over the last two years.

On technology, it would be highly instructive to see how the Top Runner programme develops; it not only shapes

the R&D investments today but will also to a large extent predict when and how much shortage/price hikes there would be for specific high-performance module types, based on Top Runner performance requirements and project deadlines. With the rooftop segment gaining traction, we see a fundamental shift in what the Chinese domestic industry values – the optimal product is now not only the one that is cheapest, but the one that is also space efficient. For years the global industry has predicted again and again that the continuous breakthroughs in mono technology would let mono demand overtake multi, but that did not happen until the Chinese market began to value mono, beginning with the Top Runner programme and now continuing to grow with its distributed PV segment.

In other words, it is key to remember that China is Chinese manufacturers' largest and possibly most profitable market, and this market is to a large extent state-controlled – small changes in policy thus have the potential to result in large ripple effects down the line, globally. ■

Authors

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References

- [1] At a NEA press conference in October 2017, Li Chuangjun, the deputy director of New and Renewable Energies explained that the (ludicrously) low 105 GW target released in 2016 was based on 2015 data, determined at a time when the cost of PV was far higher than today and when the electricity demand growth rate was 0.5%, compared to today's 6.9%.
- [2] A "base" being a cluster of projects organized and tendered in a specific region by the local authorities -- a regional tender, so to speak. In an uncommon stroke of planning, the NEA is holding the remaining 1.5GW in reserve to award to the three top-performing bases in meeting commissioning deadlines and technical requirements, and in securing the most discounted tariff rates to the local FIT. While the idea of "technical bases" had already been introduced in Round 2, it was then generally defined as projects utilising the most advanced technologies – Round 3 now establishes some quantitative criteria.