

🏆 Top 10s

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30 lowest solar PPAs worldwide

17 Jan. 2017 by Szabolcs Magyari, Solarplaza

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As a result of the mitigated costs developers have to bear when commissioning a solar PV plant, Power Purchase Agreement (PPA) agreements have witnessed a tremendous drop in the per MWh energy price that still enables solar projects to be profitable.



Globally, the prices of energy produced from solar PV have been significantly greater than that of their non-renewable counterparts in the past. This meant that solar energy could only compete with fossil fuels if it was subsidized or supported by other financial incentives. In the United States, which is considered a much more developed market in terms of the adoption of solar PV than other non-European markets, PPA prices averaged around a \$130/MW in 2010. Yet in recent years solar PV projects have not only shown that they can be price competitive with their non-solar counterparts but in some cases have proven to be significantly cheaper.

“ The lowest ever PPA price can be found in Abu Dhabi, United Arab Emirates at only \$29.9/MWh.

Reportedly, PPA auctions have been receiving lower and lower price bids from developers all around the world. In India, the average price of bids have dropped more than 60% in the last five years; Mexico witnessed bid prices that averaged only \$50/MWh; In Chile, a recent auction averaged bids of less than \$48/MWh resulting in a 40% price decline from the previously held auction.

Currently, the lowest ever PPA price can be found in Abu Dhabi, United Arab Emirates at only \$29.9/MWh, however it is definitely not certain that things will remain like this for long. The drop in PPA prices seems to be intensifying as in the year of 2016 only, the record for the world's lowest solar energy price has been broken several times.

“ By 2050 solar energy prices will be as low as \$20-40/MWh.

Figure 1 shows that global PPA prices have been declining throughout the years. On average, solar energy prices in the United States have tended to be at \$50/MWh in 2015, however, some more aggressive pricing strategies have produced energy prices as low as \$30/MWh. Europe is keeping up with the American solar PPA price trends with a small lag. According to the Fraunhofer Institute of Solar Energy Systems, solar PV energy has reached a level where it is one of the most effective sources of energy. Projections show that by 2025 prices will have declined to \$40-60/MWh in Central and Southern Europe, and by 2050 solar energy prices will be as low as \$20-40/MWh. Other parts of the world vary in average solar PPA prices by region, however, it is important to note that these regions contain more than ⅓ of our top 30 PPA prices.

30 lowest PPAs signed globally

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Rank	\$/kWh for calculations	Project name	Project size [MW]	Country	Date start operation	Company
1	0.024	ADWEA	350	UAE	2019	ADWEA
2	0.029	-	120	Chile	2019	Solarpack Corp. Tecnologica
3	0.030	800 MW Sheikh Maktoum Solar Park Phase III	80	UAE	2020	Dubai Electricity and Water Authority (DEWA)
4	0.035	427-megawatt project by Enel	427	Mexico	2018	Enel
5	0.039	-	100	USA	2018	NV Energy
6	0.040	-	0.398	USA	2014	THiNKnrg
7	0.041	Austin Energy Recurrent	150	USA	2016	-
8	0.045	Sandstone	45	USA	2015	-
9	0.049	-	50	UAE	-	Saudi Electric Company
10	0.050	-	150	USA	2016	Offtaker: Austin Energy Developer: Recurrent Energy
11	0.051	Macho Springs Solar Project	50	USA	2014	Offtaker: El Paso Electric Developer: First Solar
12	0.051	River Bend	80	USA	2016	-
13	0.060	Dubai Electricity and Water Authority	100	UAE	-	ACWA power
14	0.064	Amunche Solar	16	Chile	2017	Amunche Solar (Solarpack)
15	0.064	Indian state of Rajasthan	70	India	-	Fortum
16	0.065	-	515	USA	2016	Offtaker: Georgia Power Developer: unknown
17	0.067	-	100	India	2017	FRV
18	0.067	-	1000	India	2016	-
19	0.070	Andhra Pradesh	500	India	-	SunEdison
20	0.070	80 megawatts in solar PPAs	80	USA	2017	Offtaker: Southern California Edison Developer: Silverado Power / Ridgeline Energy
21	0.073	Lost Hills PV	32	USA	2019	First Solar and PG&E
22	0.075	Power plant Rajasthan	5	India	2013	-
23	0.076	SkyPower Madhya Pradesh	150	India	-	Skypower
24	0.078	-	5	Brazil	-	Sun premier
25	0.079	-	20	Brazil	-	Invesiones Solares
26	0.079	-	60	Brazil	-	Gransolar
27	0.079	-	410	Brazil	-	Enel Green Power
28	0.083	-	-	Brazil	-	Conergy
29	0.086	The Green Energy Corridor	500	India	2019	Offtaker: unknown Developer: First Solar
30	0.130	-	86.5	India	-	Essel Group / Rays Power

Figure 1: 30 lowest PPA prices worldwide

The most important factors influencing PPA prices

PPA prices greatly vary based on the solar irradiation levels of the project location. All countries and regions that have reported record-breaking PPA energy prices have outstanding solar attributes (Figure 2). The higher the solar irradiance level in a country, the more efficiently a solar power plant can produce electricity which eventually leads to lower energy prices. .

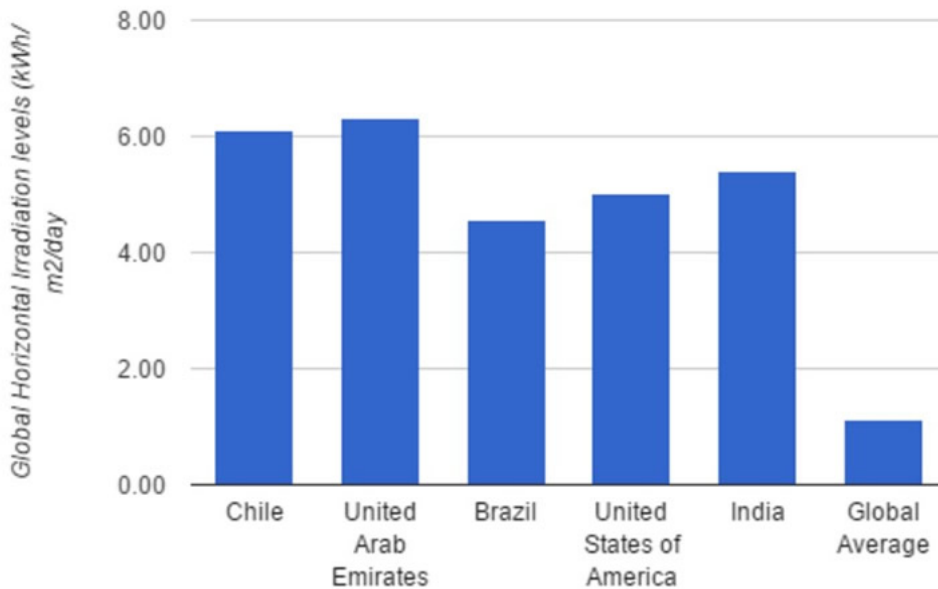


Figure 2. Global Horizontal Irradiation levels in countries with lowest PPA prices.

Another, perhaps one of the most important factor that plays a significant role in determining the energy price of solar projects, is the availability of subsidies or governmental incentives. The comparison of PPA prices around the world should be done in a very cautious manner as comparing PPA prices with and without subsidies can provide a very biased picture of the current solar energy price status.

For example, it might seem like the United States is among the countries with the most price competitive solar PPA projects and while this is certainly true to some extent, many American projects are heavily subsidized. The most prominent American subsidy, the ITC, comes in the form of a 30% tax credit which benefited Americans through a sixteen-fold increase in solar installations since the policy's implementation. However, the United States is not the only one promoting renewable energy sources through subsidies and other financial incentives. Less developed countries may also make use of subsidies including low cost financing or guarantees from development banks and/or sovereign wealth funds, or PPAs denominated in U.S. dollars to mitigate currency risk.

‘ Smaller scale PV projects (20–50 MW range) can be just as price competitive as big ones.

The size of solar PV projects also play a key role in attaining the lowest per kWh energy prices, however it does not directly follow that the bigger the project scale is, the cheaper energy it can produce. In general, utilities of scale for solar projects have proven to reduce energy prices, however, research conducted by the U.S. Department of Energy and prepared by Lawrence Berkeley National Laboratory showed that smaller scale PV projects (20–50 MW range) can be just as price competitive as big ones. Looking at our list of top 30 lowest PPA solar projects, a similar picture seems to emerge (Figure 3). Although it does show that the larger projects are in capacity the corresponding PPA prices declines, this relationship is very weak at its best.

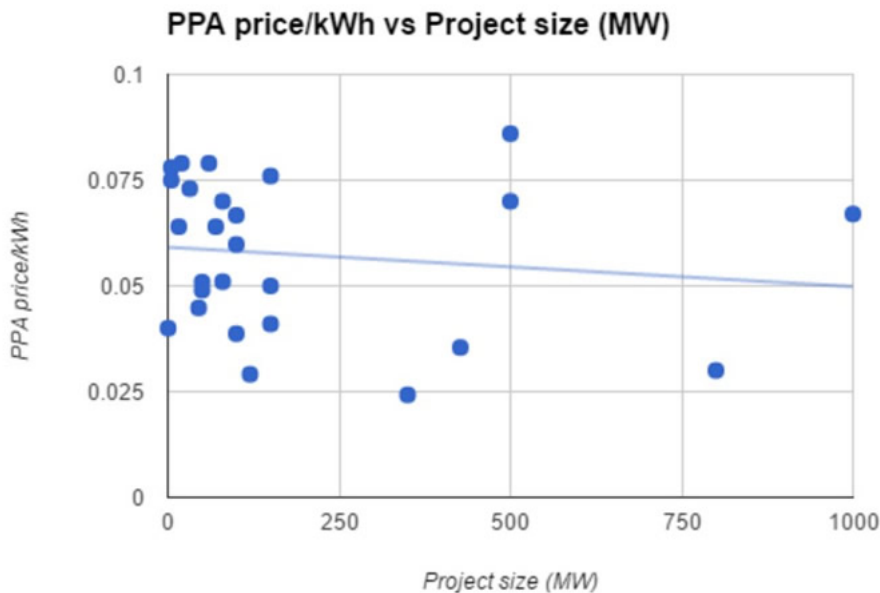


Figure 3. The relationship between the size of PV projects and their corresponding PPA prices based on our list of top 30 cheapest PPA solar projects.

If global PPA prices for solar PV plants continue to decline at the rate at which they have been so far, they will soon overtake their competing technologies. Some areas, where the conditions for cheap solar prices are met, PV projects have already shown to be superior to fossil fuel technologies. Countries with high solar radiation levels and sound incentive plans may already experience parity between solar and other energy sources. Interestingly, based on our top 30 list, the capacity of PV projects is not among the most important conditions for cheap PPA despite what one might think about the benefits of economies of scale.

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Nice table of projects, thanks for that! It's very interesting that the system cost per watt doesn't correlate to system size, anywhere in the Megawatt range. I would have assumed otherwise.

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