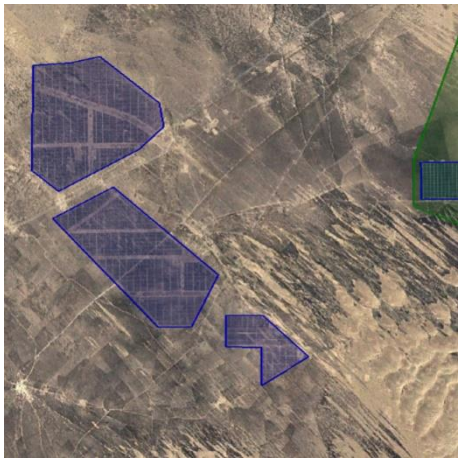
In his second article, solar pioneer Philip Wolfe lists the world's largest individual solar power plants. The biggest solar parks and other clusters of plants will be listed in subsequent blogs.

The world's largest solar power plants

A solar **plant** is an individual generating station, designed by a single developer (or consortium) and usually with a single export connection to the grid. It may in some cases be configured on several nearby plots of land and/or constructed in multiple phases. This blog looks at the largest of these individual solar power stations, highlighting those over 500 MW, and showing in brackets where it stood in the list published in 2019.

In some places solar plants are grouped together in 'solar parks' or clusters, leading to even higher capacities. As described in the introduction, these will be covered in later blogs.

#1. Gonghe 2,200 MW_{AC} (-)



China recaptures the Number One position this year with the 2,200 MW_{AC} solar power plant commissioned last September by Huanghe Hydropower Developments. It covers over 5,000 hectares of semi-desert in Gonghe County of the Hainan Prefecture in Qinghai, China.

Just visible to the east in this picture is the Longyangxia Solar-Hydro Project (3). This plant has been expanded over seven years and now covers such a huge area (220 km^2) that I will list it with the solar parks in the next blog, although it arguably meets my definition for a plant.

#2. Sweihan Power Project 938MW (0)

This 938 MW_{AC} plant in Abu Dhabi in the UAE became the world's largest single solar power station, when commissioned in June 2019, a position it held for 15 months.

The development led by Marubeni and JinkoSolar was built by Sterling & Wilson using a pitched structure with arrays totalling 1,177 MW_P at a shallow angle oriented towards east and west. As this aerial view of the plant shows, this configuration achieves a very high packing density on the 800 Ha site.

The UAE will also feature prominently in the solar parks list with Dubai's multi-gigawatt development.

#3. Yanchi Solar Park 820MW (1)

2019's number one is third in today's list – the so-called Yanchi Solar Park just south of Gaoshawo in Ninxia's Yanchi district. Despite the name, it is not a 'solar park', as we would define it.

The project was developed by China Minsheng New Energy and has been operational since 2016.

Its 1 GW_P solar arrays give it an output of about 820 MW_{AC}.

#4. Copper Mountain Solar Facility 816MW (-)

The USA's highest entry this time is at #4 (it's highest at #6 in the previous list, Solar Star, is now down to #10).

One of the US' earliest utility scale solar plants, phase one of the Copper Mountain project was first connected by Sempra Energy back in 2010. When the southernmost phase five was commissioned this March, it took the total capacity of the plant to 816 MW.

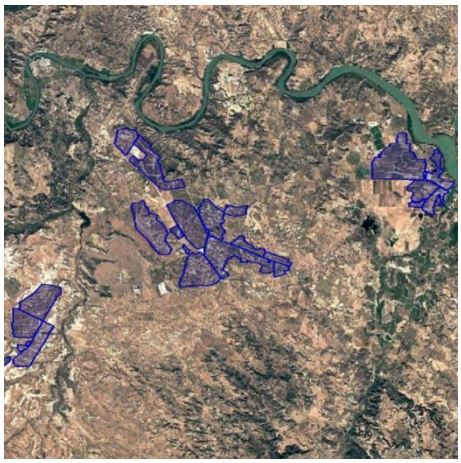
Located in Nevada's Eldorado Valley between Boulder City and Searchlight, not far south-east from Las Vegas, it surrounds Acciona's Nevada Solar One CSP project (outlined in red).

#5. Datong 'Front Runner' 800MW (2)

In China's Shanxi Province, another 1 GW_P project has been installed in Datong district, as part of China's demonstration programme for projects at this scale. The solar array is distributed on hilltops over a wide area, making them hard to pick out on satellite images.

Another project of similar size is located around Ili in Xinjiang, but is spread over such a wide area, we have not included it as a single plant in this list. Nor do we include a further GW_P project portfolio being developed around Alashan in Inner Mongolia.

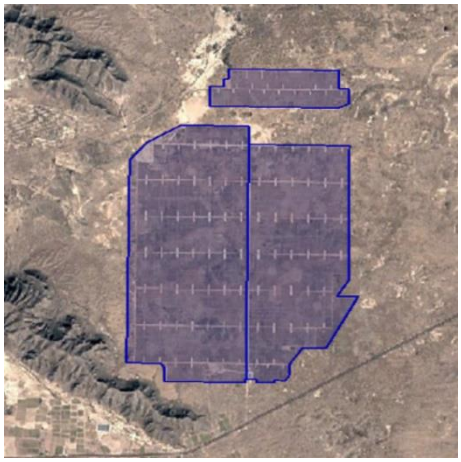
#6. Escatrón-Chiprana-Samper 730MW (-)



Spain leaps into this list at #6 with ACS Group's 850 MW_P project covering a total of almost 1,900 hectares divided between three municipalities in Zaragoza. It was commissioned in stages during 2020.

The plant, which delivers 730 MW_{AC} is owned by Galp, the Portuguese energy company.

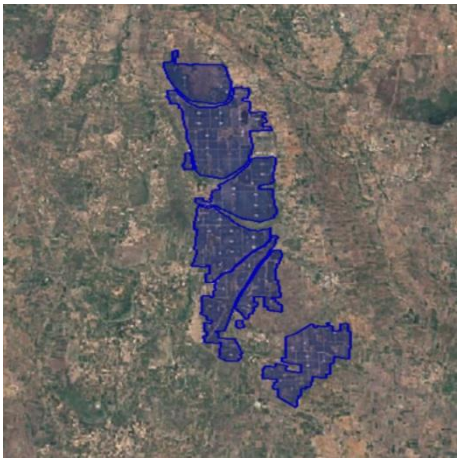
#7. Villanueva - Mexico 700MW (5)



ENEL Green Power's Villanueva project in Mexico has been expanded from 640 MW since our 2019 list, to leapfrog over the Kamuthi project.

The plant is located in Coahuila state and is one of several projects in this list to use horizontal single-axis trackers. It is therefore relatively less dense, covering an area of just over 2,600 hectares.

#8. Kamuthi Solar Power Project 648MW (4)

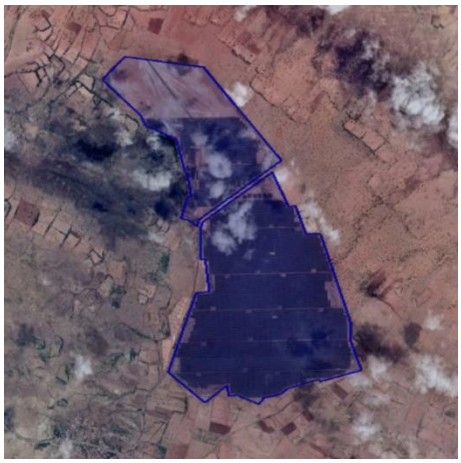


India's top stand-alone plant has now slipped down to #8, though the country will feature more prominently in the forthcoming solar parks list.

The plant was built in 2016 by Adani covering nearly 1,200 hectares in the State of Tamil Nadu, and has an AC capacity of 648 MW.

#9. Lawan-Purohitsar ISTS plant 600MW (-)

Another Indian plant – located further north in Jaisalmer district, Rajasthan – is a new entry to the list with a capacity of 600 MW.



It is one of a series of projects contracted by tender to supply power directly into India's Inter-State Transmission System (ISTS).

The project, which spans the communities of Lawan and Purohitsar in Pokhran, was connected recently by SB Energy, the company acquired earlier this year from Japan's Softbank by Adani.

#10. Solar Star 585MW (6)

Now the USA's second largest solar plant, Solar Star covers multiple sites in California's Antelope Valley.

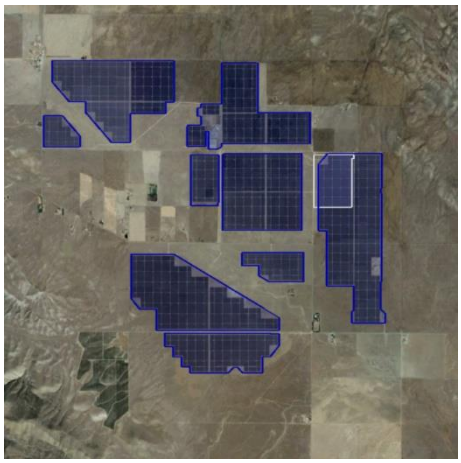
The plant was constructed in two phases in 2013-2014 using Sunpower Corporation modules. It has a total capacity of 585 MW and is owned by Warren Buffett's Berkshire Hathaway group.

#11. Hongshagang 574MW (7)

Back to China for plant #11, this multi-phase project is clustered in an area of semi-desert around Hongshagangzhen in Gansu province.

It is being built by China Singyes, with at least 574 MW now operational, and an eventual capacity of 820 MW.

#12. Topaz 550MW (8)



The USA's third plant in this list at 550 MW, Topaz was briefly the country's largest plant when commissioned in November 2014.

Developed by First Solar, it is built on multiple sites totalling nearly 1,400 hectares in Carrisa Plains in central California. Coincidentally this incorporates the site where the world's first multi-megawatt solar project was built in the 1980's (outlined in white on this image).

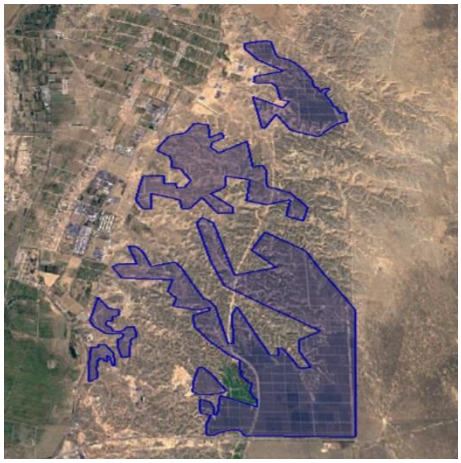
#13. São Gonçalo 549MW (-)

We go to Brazil for the first South American project to reach this list of the world's largest solar plants. But it is the second entry in Latin America for Italy's ENEL Green Energy.

The plant near São Gonçalo do Gurguéia in the State of Piauí is being constructed in three phases with an eventual capacity of 765 MW. When phase II was completed in February this year, the capacity reached 549 MW.

The plant uses bifacial modules mounted on single-axis trackers, and currently covers about 1,300 hectares.

#14. Yinchuan Xingqing 500MW (9)



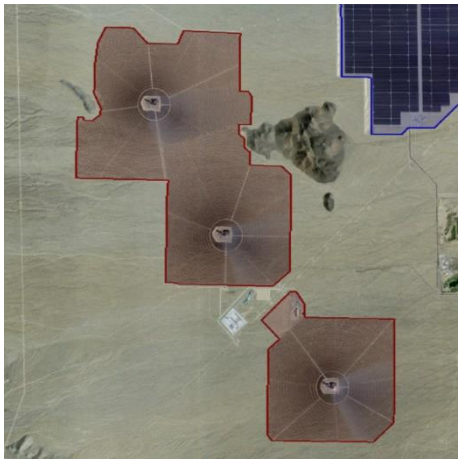
The last of the ½ GW+ solar plants is a conglomeration of hillside arrays In the valleys to the east of Ninxia's capital Yinchuan. The Yinchuan Xinqing project has a total capacity of about 500 MW, and was installed in mid-2018.

Other large plants

Just below our cutoff, with a present capacity of 480 MW_{AC}, is Vietnam's largest plant at Ea Súp in Đắk Lắk Province. This is due to be expanded, so may join this list in future.

Other large projects in development may lead to Australia, Saudi Arabia, Chile, France and Texas, amongst others, joining soon.

Largest CSP plants



No operational concentrated solar power (CSP) plant is over 500 MW – the largest currently in service is the Ivanpah plant in eastern California near the border with Nevada. Its three concentrator towers give it a nameplate capacity of 377 MW. Part of the neighbouring Stateline PV plant can also be seen on this view.

A handful of larger projects are in development in USA and the Middle East, but it is uncertain whether Oman's Miraah project will achieve the planned eventual capacity of 1,021 MW, following the liquidation of technology partner Glasspoint Solar.

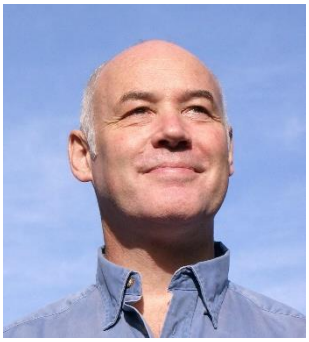
Terminology and acknowledgements

The term 'solar **plant**' is used for an individual project that has been developed by a single developer or consortium, even if it is spread over several geographical plots or built in various phases. Where multiple plants are co-located in a discrete area under the coordination of an identified agency, this is called a '**solar park**'. And I use the word **cluster** where multiple solar farms are co-located in an area without formal coordination.

Image Credits: The satellite views are from Google Earth, using imagery from Airbus, CNES, Copernicus, Digital Globe and Landsat. In these shots, individual **plants** are highlighted in blue (if PV, or red if CSP), with **solar parks** in green. Colour coding on Wiki-Solar's maps is similar.

Also for consistency, all capacities are quoted in MW_{AC} to allow direct comparison between PV and CSP plants (and other forms of generation). Readers will be aware that the DC peak capacity of PV plants is typically ~25% higher than the rated AC capacity, quoted here.

The following blog later this month will identify the world's biggest **solar parks**.



Philip Wolfe has been active in the renewables arena since the 1970s and is the founder of Wiki-Solar. His book on utility-scale solar was published in 2012 and one on the early years of the terrestrial PV sector was published in 2018.