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NEWS CLIP / 1-GW Solar Park in China

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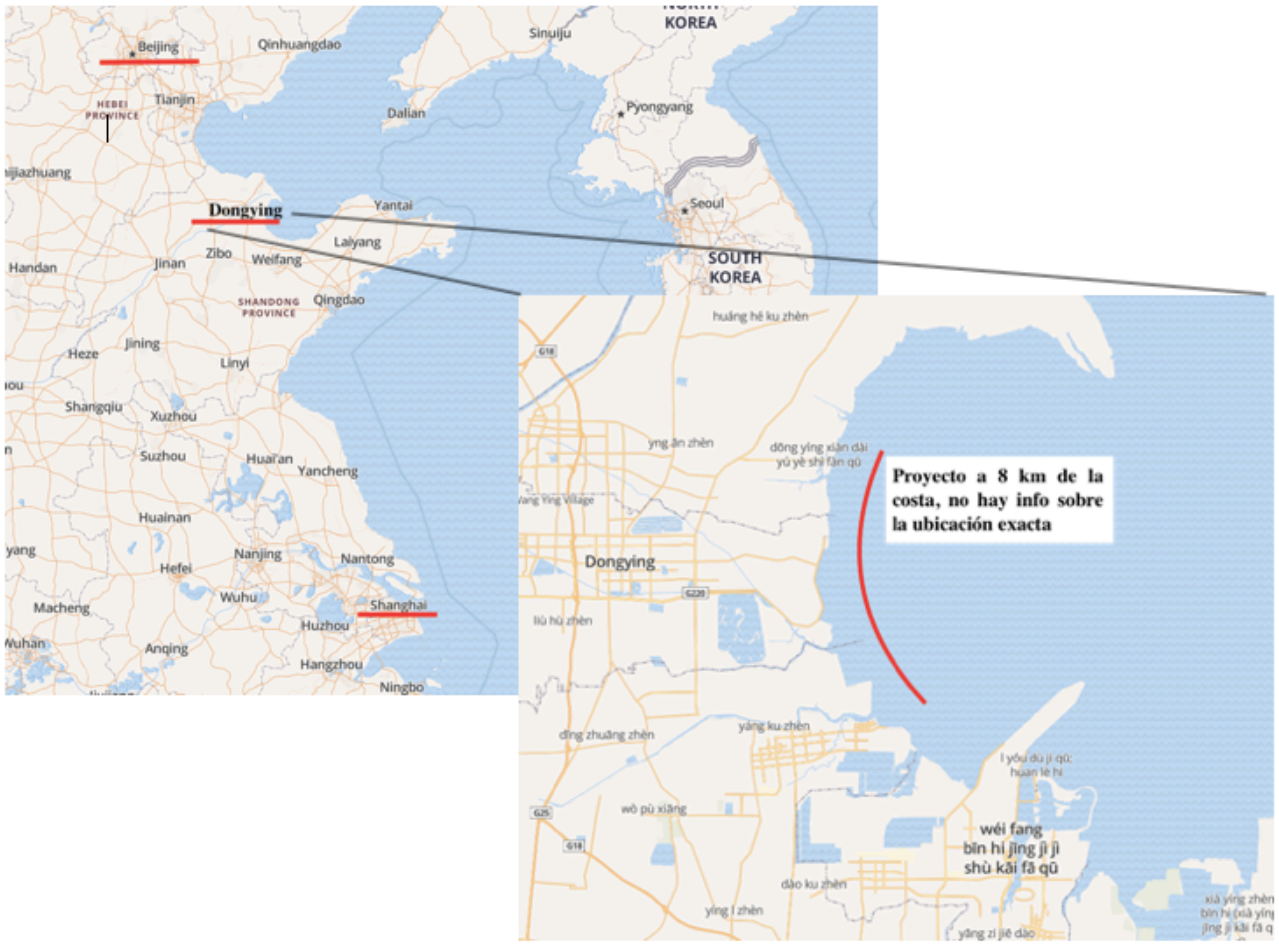
Background: In April 2023, we published an article on the Puerto Peñasco Solar Park, comparing the areas (hectares) required to build electricity generation plants with the capacity of the different generation modalities.

In this article we present a new solar plant recently installed in China and how the capacities increase over time and how the hectare-capacity ratio improves, although we still have a preference for combined cycle thermoelectric plants.

1 GW offshore photovoltaic project in Dongying, Shandong, China

The first batch of a huge offshore PV project in Laizhou Bay, off Dongying City, Shandong Province, has recently been connected to the grid.



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The project has been developed 8 kilometers offshore in the bay's shallow waters. The first batch of solar panels was connected to the national grid in the second week of November 2024. Given the size of the project, this milestone represents a further step in the development of renewable energy generation with increasingly advanced panels.

Based on publicly available information, we can report that the project has a capacity of 1 gigawatt (1,000 MW) and is expected to generate 1.78 billion kilowatt hours per year to serve 2.68 million local residents.

The solar plant occupies an area of 1,223 hectares, over which 2,934 solar platforms have been distributed, according to CNH Energy, the government entity and promoter of the project. Each platform is 60 meters long and 35 meters wide. The platforms are supported by tubular steel structures anchored to the seabed at depths of between 1 and 4 meters.
Jinko Solar supplied the monocrystalline panels and installed state-of-the-art bifacial panels designed to withstand the harsh environment, including sea salt, humidity, wind and extreme temperatures (https://www.pv-tech.org/jinkosolar-unveils-zero-carbon-n-type-topcon-modules/).
The panels are fixed and have no trackers.

The solar farm marks a significant moment for China. Picture: China News Service

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It is certainly fascinating to see the speed at which these renewable energy projects are being developed. Based on publicly available data, the Dongying Solar Project has a nominal capacity of 0.8 MW per hectare and the 1 gigawatt plant capacity will deliver 1.78 billion kilowatt hours per year, or 21% of the nominal capacity, which is considered superior.

On the other hand, we must bear in mind that the data provided on efficiency, theoretical electricity supply, CO_2 savings, etc. can be distorted by propagandistic rhetoric. Only (hard) operational data can confirm the efficiency of the plant.

Our Analysis

- Dongying plans to generate 1.78 billion kilowatt-hours per year to supply electricity to 2.68 million people.
- Each beneficiary would receive 664 kWh per year.

Confirming this with a reverse calculation and using the average annual consumption in Mexico (https://www.datosmundial.com/america/mexico/balance-energetico.php) of 2,400 kWh per household per year, to supply 2.68 million inhabitants we need to generate 6,432 million kWh.

We can see that the difference between the planned supply for the population of Dongying and the planned supply for the beneficiaries of the solar plant in Puerto Peñasco is significant. As already mentioned, in times of hype, i.e. the expectations generated around renewable energies, we must take the published data "cum grano salis", i.e. with a healthy critical view and based on real operating data.

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Generation per Hectare

The issue we addressed in the mentioned news clip (Puerto Peñasco Solar Park, 25 April 2023) was the area required to generate 1 MW of energy compared to wind and combined cycle plants. The result was conclusive and in favor of combined cycle plants.

Let's analyze the Dongying project from the same perspective:

To produce 1 MW of energy, we need an area of 1.22 hectares, taking into account the area of 1,223 hectares and a capacity of 1 GW. It should be noted that the improvement over the Puerto Peñasco solar plant (2,000 hectares / 1 GW) is 50%, which certainly is a great achievement.

On the other hand, in a combined cycle plant (in our previous publication we used the Tamazunchale plant as an example), 0.046 hectares, or 460 square meters, are needed to produce 1 MW, given a capacity of 1,200 MW on a surface of 55 hectares. The difference in yield per square meter is huge and clearly favors combined cycle plants.

Of course, there are several aspects to consider, such as

- Operating costs, which are much lower for a photovoltaic plant than for a combined cycle plant.
- The availability of land for electricity generation.
- The efficiency of the panels and the performance of the photovoltaic panels. This is influenced by the number of hours of sunshine per day, the angle of incidence, the ambient temperature, the cleanliness of the panels, etc.
- Degradation of the panels over their lifetime.

Finally - and this should be the message - it is important for each country/region to take into account its specific circumstances (target population, hours of sunlight and intensity per day, land use, presence of energy-intensive industries, etc.) in order to pragmatically establish a healthy mix between renewable, fossil and nuclear energy. The latter in particular will be an issue to follow closely with the development of SMRs (Small Modular Reactors).