When a solar power plant turns the desert into an oasis

The use and integration of renewable energy sources into existing energy supply networks often raise more problems than they solve. The main problem is the unpredictability of these energy sources; in other words, if the sun isn't shining or the wind isn't blowing, there is no energy.

However, grids do not operate in this way; at any given moment, the amount of energy available on one side must exactly match the amount consumed on the other. If this balance is not maintained, the power system collapses spectacularly. We call this 'power balancing', where conventional power stations *'hiding'* , which mainly compensate for the energy supply during periods without sun or wind by burning fossil fuels.



Furthermore, we clearly cannot ignore the environmental impact of these power stations; they raise many issues in this area too – one need only look at the endless fields covered in solar panels and thus taken out of agricultural use. Is it possible to install a solar power plant in such a way that only its benefits are realised? As the example below shows, it is possible, although even here the developers only gradually realised how to get the most out of such a facility.

Talatan Solar Power Plant

In China, on the Tibetan Plateau – a desert-like, rocky and barren region – one of the world's largest

solar power plants, the Talatan Solar Power Park, has been built on the edge of the Gobi Desert (*Talatan PV Park, Gonghe County, Qinghai Province*). The park lies at an altitude of approximately 3,000 metres above sea level. Here, the air is thinner and cleaner, and solar radiation is much more intense, which significantly increases panel efficiency. Part of the solar park also functions as a test site: hundreds of different types of solar panels and mounting structures are being tested here under extreme conditions to determine which are the most durable in desert storms.

It covers a total area of more than 600 km² (larger than Budapest), and its final total capacity will be 21 gigawatts, which is more than ten times the capacity of, for example, the Paks Nuclear Power Station. Most of the park's output will be transmitted without compensation via a specialised, ultra-high-voltage (*UHV*) power line to distant cities such as Henan, where China's most energy-intensive data centres and artificial intelligence infrastructures utilise this energy. A smaller portion, roughly 850 MW, remains locally. The compensation for this amount of energy has been handled in an interesting way.

On the left-hand side of the Google map, part of the solar power station can be seen, whilst the hydroelectric power station is in the centre. You can zoom in on the map by holding down the Ctrl key and scrolling with the mouse.

The prototype of the 'Hydro-Solar Hybrid'

This smaller, 850-megawatt section of the solar power station was built right next to the Longyangxia hydroelectric power station on the Yellow River (*Longyangxia Dam Solar Park*). When the sun is shining, the solar power station generates electricity, whilst the hydroelectric power station's output is curtailed (allowed to *'accumulate'* in the reservoir). When it is cloudy or in the evening, the dam gates are opened. In this way, the hydroelectric power station acts as a sort of giant battery, stabilising the fluctuations in solar energy. The power station operates four Francis turbines, each with a capacity of 320 MW, which are capable of delivering a total output of up to 1,400 MW for short periods at maximum load; in this system, the solar power plant is regarded as the *"fifth turbine"*.

The emergence of an 'accidental' oasis

Solar farms and the desert do not mix. The constant wind carries dust and sand onto the solar panels, so they need to be cleaned continuously. The cleaning is carried out by autonomous robots moving on rails, which use water from the nearby Yellow River to wash the dust off the solar panels. The runoff seeped into the ground, and due to the cooler microclimate beneath the panels, evaporation was significantly reduced (by as much as 30 per cent); and, moreover, the panels provided shelter from the hot (and, at night, freezing cold) desert winds.

As a result, grass began to appear within a few years in an area that had previously been covered almost exclusively by sand, and vegetation cover increased from 0% to nearly 80%. The desert became so overgrown that it began to cause problems. The grass and vegetation, growing too tall, began to shade the panels, which reduced their efficiency and, during dry periods, even posed a serious fire hazard. Mowing the grass by hand would have been slow and expensive over such a large area.

The ‘Solar Sheep’

This is where the *‘classic’* solutions come into play once more, this time in the *“in the form of”* (I know, it’s a bit of a stretch). Initially, they simply began grazing sheep in the shade of the solar panels, but as the *“organic lawnmowers”* proved their worth, they were permanently settled in the solar farm.

The sheep get lush pasture and cool shade for free, whilst the solar farm gets *‘lawn mowing’* and natural fertilisation of the soil for free. Seeing how successful this was, subsequent panels were installed higher up (1.2–1.8 metres instead of 50 cm) so that the sheep could fit comfortably underneath them and would not climb onto the panels.

The project has helped thousands of local families out of poverty. Today, more than 20,000 sheep *are “working”* in the park, and there is even a separate brand for *“Solar-Powered Mutton”*, which is sold online throughout China. This unusual combination even has its own technical terms: **Agrivoltaics** (*the combination of agricultural and photovoltaic systems*), whilst the sheep themselves are known as **solar sheep**.



What’s more, thanks to the return of vegetation, not only sheep but also smaller wild animals (rabbits, foxes) and birds have appeared in the area, thereby slowly transforming the desert ecosystem.

The Chinese government and the park’s operators have recognised the site’s scenic value, so they have established visitor centres and viewing points as part of the Longyangxia tourist area. Here, tourists can take organised tours to view the *“blue sea of solar panels”* and the sheep grazing amongst and beneath them. Unfortunately, as the park is situated in Qinghai Province on the Tibetan Plateau, foreign tourists require special permits to visit the area.

Of course, the thought arises that humanity is once again encroaching on an untouched ecosystem here, and that is not a good thing. However, we must bear in mind that our energy demands are constantly rising; artificial intelligence, for example, is a huge energy guzzler, and that energy must be generated from somewhere, preferably in a carbon-neutral way. What's more, the desert is expanding year on year, mainly as a result of climate change; so, if you look at it that way, this project also helps to reclaim land from the desert.

An interesting article in English YouTube-film on the subject can be found at.

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