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Floating Solar Power Farms: How Water is Making Solar Bigger

Outside of the Box Energy Production, Europe's largest floating solar power farm has recently started generating electricity from the sun. Constructed on the Queen Elizabeth II Reservoir, located on the outskirts of London at Walton-On-Thames, this Tetris-like island of 23,000 photovoltaic panels, 619,000 square feet in size, will generate 5.8 million kilowatt hours of electricity each year for nearby water treatment plants. This is about a third of the power required to deliver clean drinking water to ten million people living in Greater London.

You might think solar panels and water don't mix, and you'd be right. They would quickly sink to the bottom of a lake. To prevent this source of energy from becoming something only deep sea diver would be able to find, the panels are attached to floats, which are grouped together in rafts. 177 anchors were deployed 60 feet deep by divers to keep the groupings securely in place. The floats, which house wiring and inverters that convert solar energy into electricity, are also designed to keep the working parts from getting wet.

The Walton-On-Thames solar farm project spent five years in the planning process, took three months to construct, and cost nearly $8 million dollars. When you consider the reservoir itself primarily helps to power the entire water treatment process, the math starts to stack up in its favor, especially when you factor in generous government subsidies.

Deploying solar panels on reservoirs or lakes gives water a job when it wouldn't normally be employed doing anything. Further, because the panels shade the water surface, water evaporation is reduced by up to 90%, and harmful algae growth is impeded. There are other benefits of using solar panels on water. The water helps cool the panels and the wiring, and because solar panels operate best at lower temperatures, this cooling improves the efficiency of the solar panels by up to 60%.

Solar panels cover only about 10% of the total water surface area of the London reservoir, so there is minimal disruption to the existing ecosystem, which exists of only a few uninvited moorhens and gulls that live on the margins, and a few lost fish.

Of course, solar energy doesn't generate as a flat base load; it produces only when the sun comes out. The water treatment plants the London floating solar farm is servicing still need to rely primarily on conventional electricity. Solar energy, like all renewable energy, can only contribute partly towards the overall energy mix. As with the wind, it is an important component of an overall renewable energy strategy. Still, with companies worldwide now under pressure to decarbonize their industrial processes, renewable energy is starting to look increasingly attractive. Wineries, dairy farms, and fish farms are all examples of industries that can benefit from solar energy, using bodies of water as diverse as reservoirs, quarry lakes, and irrigation canals.

Japanese Floating Solar Farms

Like the UK, Japan suffers from a limited land area, so it is unsurprising that it is already building what will surpass the London floating solar farm as the largest in the world. Land space was just one consideration for Japan. After the 2011 Fukushima disaster, the country has sought to invest more in renewable energy while closing down nuclear plants.
The Japanese floating solar farm is being built by Kyocera on the Yamakura Dam, in the Chiba Prefecture. When it is completed in 2018, it will comprise 50,000 solar photovoltaic panels in a mindboggling area of nearly two million square feet, and will generate 13.7 megawatts of electricity for approximately 5,000 households. For such a small country, the Japanese are certainly thinking big!

In a curious anomaly with land-based solar power farms, even a floating farm as large as Kyocera's would not figure in a list of the top 100 of the world's solar farms. Where the land is available, it is much cheaper to install solar panels on rooftops and farmland than to attach panels to rafts of floats. Nonetheless, Kyocera has already placed three other such floating solar power farms in the Hyogo Prefecture, although these are much smaller than the Yamakura Dam project.

Floating Solar Power Farms in the US – Does It Make Sense?

So why would we in the USA encourage the construction of floating solar power fields at all? We have seemingly unlimited acres of land available. It would appear all too easy to stick to building the standard, inexpensive land farms, which profit farmers and benefits consumers with lower energy bills.

One California-based company, however, Sonoma Clean Power, is championing just the opposite. SCP is currently building a 12.5-megawatt floating solar farm, which will be only second in size to the Yamakura Dam project. When it goes online later this year, it will provide 3,000 homes with clean electricity.

California's ongoing drought has left millions of acres of farmland dehydrated, and because of this, the water conservation value of a floating solar farm is brought into stark relief. Sonoma County contains well over a thousand irrigation storage ponds, which located close to existing infrastructure and distribution lines. SCP's floating farm, or floatovoltaic system, will be built on docks spanning six wastewater ponds. The economic success of these docks relies on the crucial point that the ponds be leased at a lower rate than for farmland while still delivering a modest revenue stream to the water rights owners.

Sonoma County will not be the first in California to house a floating solar power farm. In the Napa Valley, the Far Niente winery pioneered the world's first large-scale floatovoltaic system with a 1,000-panel array on its irrigation pond. Working alongside a 1,300-panel array installed on land, Far Niente receives enough solar energy to power all its needs.
Although floatovoltaic systems presently produce not even 1% of the world's solar energy, that figure is bound to escalate as water's commodity value increases in line with global warming. The International Energy Agency has predicted that the sun will become the world's largest source of electricity. With solar panel prices already nearly two-thirds lower since 2010, thanks to Chinese manufacturing, that prediction looks increasingly likely to be met.