Project Briefing:

TAKING FLOATING SOLAR TO NEW TERRAINS

Project name: Guping Reservoir Floating PV (FPV) project
Location: Qintang district, Guigang city, Guangxi Zhuang Autonomous Region, China
Capacity: 20MW
Energisation date: December 2019
Investment value: RMB70 million (US$10.8 million)

The adoption of floating solar is accelerating the world over, and Asia has taken a leading position in the adoption of FPV (see page 26). With the aid of subsidy support, technological advances and ever-growing comfort with the technology class, FPV is being taken to ever newer and more hard-to-reach bodies of water.

Located in the southeastern part of Guangxi Zhuang Autonomous Region, China, Guigang city is an important gateway leading to the ocean for the southwestern part of China. Lying on the middle reaches of Xijiang River, it is also the first major inland river port in western China.

Floating on that body of water is an FPV install that boasts a raft of unique features and novel technological approaches. The 20MW Guping reservoir FPV plant is located in Qintang District, Guigang City, Guangxi Province. Built over an irrigation reservoir, the total power production capacity generated over its expected 25-year life span is forecasted to exceed 470 million kWh, averaging at over 19 million kWh annually.

Construction of the FPV system kicked off in October 2019. The plant was contracted by Sungrow and connected to grid at the end of December of the same year. The total project investment exceeded RMB70 million (US$10.8 million).

Compared to power plants of 50MW or 100MW, the 20MW Guping Reservoir FPV is not among the largest floating solar installations in China, where FPV project sizes continue to grow. What makes this project stand out, however, is the unique technologies used in its development and the picturesque surroundings it finds itself in, the basin itself surrounded by mountains and rivers. Furthermore, the formation of the reservoir, and the deployment techniques used to float solar atop it, set it apart from others.

Building on the Karst

It is not easy to build a FPV plant in such a scenic spot. Among the issues to be considered are local ecology protection and adaption to special geomorphological features.

The Guping Reservoir FPV site features Karst landforms, bodies of water formed by the dissolution of soluble rocks – typically limestone or gypsum – which can eventually give way, posing unique issues to overcome. China's Karst landforms are concentrated in Guangxi, Guizhou and Yunnan provinces, but are most widely found in Guangxi province. This creation of Karst landforms makes elements of developing infrastructure projects, including solar PV, particularly difficult. "Underneath the reservoir is a Karst landscape, piled with easily eroded rocks, making it impossible to drive piles. The cost of driving piles is also very high," says Kane Wang, system solution manager at Sungrow Floating Solar, the Sungrow division dedicated to FPV.

The 20MW Guping Reservoir Floating PV project was completed in Decembe 2019.

Credit: Sungrow.

The project's design combines rods and floats which hold the modules in place.

Credit: Sungrow.

Based on the underwater geological survey report and local conditions, Sungrow applied its new generation of floating system in this project. Instead of using more traditional floating products, the company developed a plan combining floating bodies and rods. The output of a single super-large floating square, designed with special deadweight anchors, can reach up to 7MW.

"The anchoring system is the key factor at play for the safe and smooth operation of this FPV system. To this end we've introduced a scheme combining rods and floating bodies. In the north-south direction, a kind of galvanized Al Mg alloy rod is used as the connecting piece.

"The pull force at a single anchoring point can reach up to 25KN. For a traditional floating array, due to the use of HDPE materials, the maximum tensile force of the anchor point is only about 15KN. Generally speaking, the less anchorage points, the less anchoring costs. The high strength at the anchorage points is effective in avoiding accidents which are often triggered by insufficient pull force," Wang says.

The HDPE material referenced by Wang is a food-grade, durable and weather-resistant material independently developed by Sungrow in the company's advanced floating body materials research laboratory. Both acid and alkali-resistant, the material is said to be performing very well in harsh environments, such as cold or hot conditions, and capable of meeting the 25-year design life requirement that comes as standard with operational solar projects today.

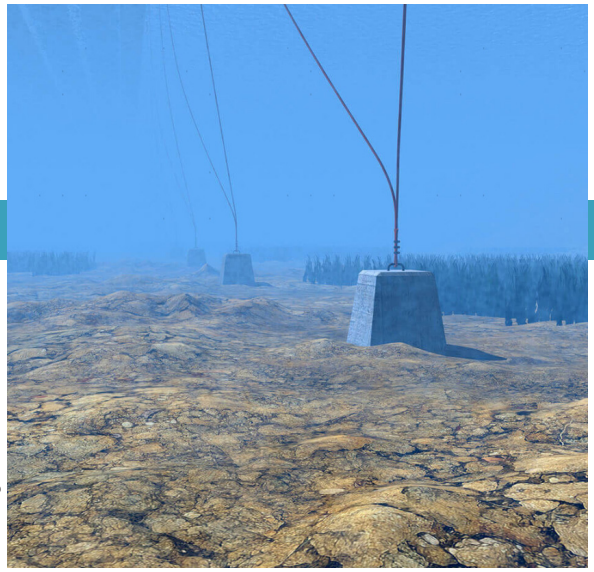
In addition, the possible impact on the ecology of the body of water and its surroundings has also remained a consideration in Sungrow's design of floating solar installations. These installs feature low water surface coverage, higher light transmission and better oxygen dissolution which, in short, makes for a lesser impact on the quality of water sitting beneath the panels. This is in comparison to alternative floating system solutions which can allow for more than 45% of the water's surface to be directly covered by solar arrays.

"Our products can ventilate and cool down the PV modules very well, [which] is quite effective in increasing the output of electric energy production capacity. Our R&D efforts were also directed at enhancing electric energy production capacity and delivering environment-friendly products," says Wang.

Wang points to research from third-party institutions in the Netherlands and Singapore – two other markets where floating solar's rise has been particularly prominent – have found that floating PV systems with open structures can provide a higher heat loss coefficient by allowing wind to pass beneath the modules. Proper system design, therefore, allows for more heat convection between the modules and the water surface.

Construction, operation and maintenance

Sungrow's system has been easy to install and operates efficiently, contributing towards an accelerated construction process. It took just over two months from the construction start in October to grid connection at the end of December 2019, a rapid deployment for a floating solar project of this size.



Credit: Sungrow.

The design of special deadweight anchors used in the project.

Credit: Sungrow.

Other project components have also been floated alongside the structure.

Recognising the benefits, the local government also offered its support of this FPV project. As a novel mode of power generation, FPV is conducive to local green energy development, and local residents also benefited by taking part in plant construction, many receiving employment as a result.

"Most of the FPV installations are assembled at a construction platform onshore. Floating solar assembly is a repetitive operation, not a skill-demanding task. We hired local people to do that, which also increased their income," Wang says.

Aside from construction, the ongoing operation and maintenance – right the way through from part replacement to panel cleaning – constitutes a massive part of any given operating power plant. But floating solar O&M is proving much easier than their ground-mounted counterparts. According to Sungrow, most of the walkways required to clean the panels and conduct other O&M services were pre-installed within the project area at the build phase. As a result, workers can access each module through these channels, and the low module height makes for easier manual cleaning, with water used capable of being captured on-site. No additional treatment for the water, as it is collected via rainfall and stored simply for use in irrigation, is needed before it can be used for panel cleaning.

In addition, Wang says the air above the reservoir is much cleaner than the air surrounding it, meaning modules used in the installation continue to be much cleaner than those used in other projects, avoiding the potentially costly effects of air pollution. These modules do not need to be cleaned quite so often, thus the operation and maintenance costs are reduced.

A replicable model?

Having customised the design of floating solar to be more suitable for the specific landscape and environment this project required, Sungrow is keen to take inspiration from it and develop further ideas for new FPV projects. The Guping Reservoir project is the first from Sungrow to be deployed on Karst waters, but it doesn't stand to be the company's last.

Since its grid connection at the end of December 2019, the plant has met operating expectations. "At present, the combination of power generation on water surface and water storage has beenly a widely accepted dual-benefit model in Southeast Asia. With the gradual promotion of FPV technology, more such FPV plants will be built in future on the Karst waters of Guangxi, China," Wang says.

As floating solar projects continue to be built, a developing, more technologically-advanced industry is being built around it and is, quite literally in this instance, charting new waters. Tech upgrades and novel approaches are allowing for FPV to be constructed in more areas than ever before.

Sungrow Floating Solar's stated aim is to continue FPV on that trajectory, given the significant benefits the generation class poses. "FPV uses no land resources and boasts high output of electric energy production capacity. With technology advancements, the reduced cost of annual electric energy production capacity supports wider FPV adoption. As more countries and regions are joining in, many African countries included, the global FPV markets at multiple regions are bound to grow tremendously," Wang says. ■

An O&M technician inspecting the plant

Credit: Sungrow.