

Co-Located Fish Farm and Solar Plant Selected by Taiwan as Sustainable Aquaculture Model

Background

Co-locating solar plants with fish farms is an emerging trend in regions abundant with aquafarming production. This symbiotic model—a type of Agri-PV application—is playing a growing role in promoting renewable energy policies in Taiwan, where cultivable land is limited. It aligns with the government's commitment to implement new forms of sustainable energy to meet its ambitious goal of deploying 20 GW of solar PV installations by 2025 and have 20% of the country's electricity generation come from renewables by 2050*. To encourage investment in PV, Taiwan has instituted attractive feed-in-tariff (FIT) rates for fish farmers installing PV systems.

The Challenge

When the owners of a family-run fish farm in Southern Taiwan wanted to modernize their operation, they decided to produce clean solar power onsite and export it to the grid in return for government FIT revenue.

They searched for a PV system that would overcome several challenges:

- / **Ensure uninterrupted fish farming operations**
- / **Achieve high energy output** that offsets lost solar due to aquatic bird droppings on modules and accessibility constraints
- / **Safeguard site personnel and minimize potential financial losses** associated with cyber risks
- / **Help conserve wildlife habitat ecosystems** serving as a government-approved model site for scientists to observe PV electricity generation integrated with sustainable fish farming.

*Source: https://www.moea.gov.tw/MNS/english/Policy/Policy.aspx?menu_id=32904&policy_id=19

The Solution

The site owners selected the SolarEdge 2.4 MW DC-optimized inverter system for its proven ability to maximize energy yield. This is achieved through SolarEdge's Power Optimizers which maximize power output for each individual module. Plus, its advanced PV Monitoring Platform can save O&M costs.

Safe and Easy Access for Workers and Buyers

The PV system and farm owners together with the EPC took an innovative, holistic approach to integrate the PV system into the existing farm site, achieving various financial, logistical, and ecological goals. A series of structures were built above the walkways separating the ponds where milkfish and white shrimp are cultivated. The PV modules were mounted over these structures, providing shade and shelter from the elements. Elevated four meters above the ground, these structures allow sunlight to penetrate the water, so fish yields are maintained. By distancing the modules from the ponds, fishery operations are not interrupted by PV service crew visits. With widened walkways enabling more PV modules to be installed above, farm workers can easily haul fish feed and equipment by car, and buyers can transport the daily catch. In addition, routine PV module inspection becomes more convenient.

To comply with sustainable fish farming standards defined by ITRI (Industrial Technology Research Institute, owned by the government), the site owners committed to conserving natural bird habitats and other wildlife ecosystems.



SolarEdge Monitoring System enables remote module-level system performance tracking and troubleshooting

MPPT Mitigates Module Mismatch to Maximize Power

To increase solar output, SolarEdge's built-in module-mismatch mitigation minimizes power losses caused by partial module shading. This shading is particularly acute in this type of site which attracts aquatic birds that soil the modules with droppings, and where dust and sand carried by sea winds accumulates on the modules as well.

The SolarEdge inverter system working with its Power Optimizers is designed to continuously track the Maximum Power Points of every two modules adjusting current and voltage at the module level. As a result, underperforming modules do not affect others on the same string, which minimizes module-mismatch power losses and maximizes energy production.



Easier Maintenance with At-a-Glance Troubleshooting

SolarEdge's Monitoring Platform accessed remotely from any computer receives granular data from the Power Optimizers, each automatically tracking the performance of every two modules. By receiving real-time notifications, O&M personnel can quickly pinpoint and identify underperforming modules and troubleshoot faults remotely, saving onsite service time.

Given the hard-to-access PV panels mounted high above the walkways, the Monitoring Platform can also

spare additional costs of solar panel lifting devices and thermal imaging drone cameras for inspecting and diagnosing the module arrays, amounting to significant overall O&M cost savings.

SolarEdge's long-term warranties include 20 years of coverage for the inverter, and 25 years for the Power Optimizers. This can save equipment replacement costs during the system's lifetime and provide extra peace of mind for the system owner.

Advanced Cyber-Security for Safeguarding Critical Operations

As with any critical infrastructure, PV systems connected to the electricity grid should be properly secured against potential cyber-attacks. SolarEdge implements advanced cybersecurity measures across its entire line of smart inverters, data and communication infrastructure. Its built-in multilayered cybersecurity approach is designed to provide protection against unauthorized attempts to access the SolarEdge system. To protect data integrity, communication, and operation, SolarEdge embeds information security into its products, safeguarding system connectivity, functionality, and stored data.

Keeping People and Assets Safer

With farmers and fish wholesalers passing daily underneath the PV system, and solar service crews performing periodic maintenance, it was extremely important for the system owners to evaluate safety features before choosing a PV inverter.

To minimize potential risks, in the unlikely event of a fire caused by infrastructure wear and weather or even a PV-related power outage, SolarEdge products include built-in multilayer safety features that meet and exceed industry requirements.

For example, the SolarEdge SafeDC™ feature is designed to reduce the output DC voltage of each module to a touch-safe level when the AC power or the inverter is shut down for corrective maintenance or in an emergency event. SolarEdge arc fault detection and prevention is designed to detect and terminate electrical arcs, preventing potential fire risks by sending O&M personnel notifications pinpointing the exact location of the issue.

SolarEdge PV inverters are dust- and water-resistant with IP65-rating. The Power Optimizers are IP68 rated and can operate at up to 100% humidity levels; they are also resistant to ammonia—a common pollutant in fishponds.

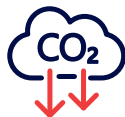


Helping to Protect the Environment

This 2.4 MW PV system produces energy equivalent to:



Saving **24,902** trees
From April 2023 to
October 2023



Saving **834,308.6** kg
CO₂ emissions From April
2023 to October 2023

In addition, the owners are committed to conserving waterbird habitats, ensuring they are unaffected by the fishery and PV plant operations. When drawing down water levels for filtration and periodic maintenance of pond walls and walkways, the owners keep minimal water levels so birds can feed on remaining fish and shrimp.

Bottom Line

With increasing world population and the global decline of natural fish stocks, demand for fish and other aquatic foods is on the rise. [Consumption of aquatic food is expected to grow by 15% to supply an average of 21.4 kg per capita in 2030.](#) By 2050, it is [estimated that aquaculture production would need to increase from 82,087 Kt \(thousands of tons\) in 2018 to 129,000 Kt.](#) As more symbiotic fishery PV models emerge, this trend could play a greater role in contributing to food security and nutrition and in reshaping the future of sustainable fish farming.

// As the owners of the fish farm and PV system who perform all the routine maintenance ourselves, we were determined to invest in top-quality products. After comparing different brands, we found that SolarEdge's higher power generation capacity can help us maximize our revenue. An issue of critical importance for us is information security, and we selected the SolarEdge brand for its built-in, multilayered safety features designed to keep the system components, as well as the system data, secure. In addition, the Monitoring Platform allows us to track the power generation status of each solar panel, making maintenance and operation more convenient. Plus, the long-term warranty gives us more peace of mind."

Shi-Sen Yang, Owner of Qun Yang Intelligent Agriculture Co., Ltd.

Installation at a Glance

System Details:

Company & System Owner: Qun Yang Intelligent Agriculture Co., Ltd.

Location: Qieding District, Kaohsiung City, Southern Taiwan

Capacity: 2.4 MW

PV System Type: Fishery and electricity symbiosis

Installation date: April 10, 2023

Inverters: 18 X Synergy 120kW inverters

Modules: 5448 X TSEC 440W

Power Optimizers: P950 x 2755



About SolarEdge

SolarEdge is a global leader in smart energy, delivering innovative commercial and residential solutions that power our lives and drive future progress. Leveraging world-class engineering and worldwide experience, SolarEdge developed a ground-breaking intelligent inverter solution that changed the way power is harvested and managed in photovoltaic (PV) systems. As a result of this and other innovations, today SolarEdge is a world-leading solar inverter company with millions of systems installed in over 140 countries, amounting to 43GW capacity. The company (SEDG) is traded on Nasdaq, and over 50% of Fortune 100 companies have SolarEdge systems on their rooftops.