

# POWER PROFILE

**Customer:** Bartlett Lake Marina

**Location:**

Carefree, Arizona

**Customer Business Issue:**

Low-cost power, reduce emissions

**Solution:**

Cat® Energy Time Shift (ETS1500) module,  
Master Microgrid Controller (MMC),

XQ230 mobile diesel genset

**Cat® Dealer:**

Empire Power Systems



*Bartlett Lake's microgrid consists of a 400 kW solar array with 895 solar panels mounted on the roof of the boat slips that provide power to the marina.*

**POWER NEED**

Bartlett Lake is an Arizona reservoir that was formed by constructing a dam on the Verde River during the late 1930s. Located 48 miles northeast of downtown Phoenix in the Tonto National Forest, the Bartlett Reservoir area is noted for spectacular desert mountain vistas and Sonoran plant life.

Part of the west side of the 12-mile-long, 2,815-acre reservoir is devoted to camping and picnicking. Bartlett Lake also has a five-acre beach area.

The lake has become a popular recreation area thanks in large measure to Bryan Church, an entrepreneur who opened Bartlett Lake Marina in 1995.

Some doubted Church's ability to construct a marina in a fairly remote location that was not connected to the utility grid. But Church persevered, ultimately turning the lake into a destination for boaters.

Now in its 30th year, Bartlett Lake Marina draws more than half a million visitors annually. More than 200 slips store a variety of watercraft from jet skis to 70-foot houseboats, and a boat club enables members to rent boats at an affordable rate. A full-service, sit-down restaurant opened seven years ago.

Several aspects of the marina are notable. First, it floats, so when the lake level rises—as it tends to increase in the spring when the Verde River headwaters to the north swell from melting snow—the marina rises too.

Perhaps more significant, to this day, no utility lines extend to the lake or the marina. When it comes to supplying power, Bartlett Lake is on its own. Therefore, Church has always operated his own distributed energy system.

Until recently, the power came from diesel generator sets, which ran almost continuously, burning a high volume of fuel and requiring additional support from rental gensets when periodic repairs and maintenance were needed.

**SOLUTION**

But a solution was in the offing. Several years ago, one of the boat owners at the marina, Stephen Jew, commercial director for Nerd Power in Gilbert, Ariz., talked to Church about converting the marina to run on solar power. Jew, who has significant residential and commercial solar installation experience, explained:

"A little over four years ago, I started coming to the lake every Thursday with a group of friends, and I slowly got to know the owner. At the time, Church had been looking into utilizing renewable energy. However, he was struggling to secure the funding, but we found a solution."

Nerd Power partnered with Cat® dealer Empire Southwest, who has extensive experience in solar and hybrid energy solutions design, installation, and maintenance throughout Arizona, Nevada, and California, to design a hybrid microgrid energy solution.

"There were a bunch of issues that we were trying to solve with this project," adds Jew. "It started with trying to reduce their diesel fuel costs, and whether we could offset the property's entire load with solar panels."

To strengthen the financials of the project, Nerd Power was able to trade the emissions credits from the reduction in CO<sub>2</sub> generation between the original diesel gensets and the new solar plus storage based hybrid microgrid energy solution.

Under the emissions trading program, purchasers and suppliers trade in emissions allowances, which results in a market price for CO<sub>2</sub>. Trading emissions credits provided Church with the necessary funding he needed to proceed with design and construction. Jew worked with Empire to source the solar modules, battery energy storage system, diesel genset, and microgrid controls for the hybrid microgrid.

While there were some delays launching the project due to the coronavirus pandemic, obtaining financing, and making design changes, once underway it took about 18 months from start to finish, with final commissioning taking place last fall.

The microgrid consists of a 400 kW solar array mounted on the roof of the boat slips. The array provides power to the marina. A cable carries the current generated by the solar panels a short distance across the water and uphill, where the power feeds into a Cat Energy Time Shift (ETS1500) module—a scalable, rapidly deployable energy storage system consisting of a bank of lithium ion batteries and a Cat BDP1000 inverter housed inside a 22' by 8' by 9.5' container. The ETS module provides 1,518 kilowatt hours (kWh) of power.

# POWER PROFILE

**Customer:** Bartlett Lake Marina

The stored energy from the batteries is released when the solar panels are not providing sufficient power to the marina. Additionally, a 200 kW Cat XQ230 mobile generator set that meets U.S. EPA Tier 4 emission standards runs when the battery is low and more power is needed.

A Cat Master Microgrid Controller (MMC) acts as the brain of the microgrid, integrating the photovoltaic system, generator set, and energy storage system to maximize penetration from renewable energy sources and enhance system reliability.

## RESULTS

The microgrid solves multiple issues for Bartlett Lake Marina.

“It’s a complex system, but really it’s a big battery box that provides stored energy to the lake, and we (Empire) support and maintain all of those systems here locally to make sure that the marina has power when its needed,” says Brett Tolman, a power systems sales engineer for Empire Power Systems. “We perform scheduled maintenance on the batteries twice a year to get our eyes on it and make sure everything is performing like it should,” he says. “The battery has a monitoring system that notifies us if any issues are detected. The batteries and the inverter are fairly low maintenance.”

This hybrid microgrid energy solution solves the main issue for Church, which was the cost of diesel fuel for the mobile diesel generators that were supplying power to the lake.

Tolman says, “The solar option is a great solution, but the sun only shines during the day, and things are going on at the lake overnight. So that’s where the batteries extend the benefit of solar beyond the sunlight hours.”

The new solar-battery storage configuration provides the marina with about 95 percent of its energy, with the generator supplying the remainder.

“There are a lot of benefits to having a system like this,” Church says. “People nowadays are more environmentally conscious, so this could be an incentive to visit Bartlett Lake and keep their boats at the marina. We’ve reduced the noise, as well as the emissions from the old diesel generators.

But for Church, the biggest benefit is the long-term savings he will realize.



*Until recently, the power came from diesel generator sets, which ran almost continuously, burning a high volume of fuel and requiring additional support from rental gensets when periodic repairs and maintenance were needed.*