

## Solar

Continued from A1

in the years since.

"We were working with the Jet Propulsion Laboratory and national laboratories that had built solar power systems for satellites," said Ed Kern, who was part of the Lincoln Lab project team that took on the Natural Bridges solar project. "We said, 'OK, what can we do with them on Earth?'"

### LOTS OF SUN AND NO POWER

That led to a search for sites where there was no access to the electrical grid and there was plenty of sunshine.

After considering 63 sites at national parks and monuments, the winner was Natural Bridges, Utah's first national monument, dedicated in 1908. It was about 50 miles from power lines in Blanding and soaked up desert sun 12 months a year.

"The factors influencing this decision included NBM's remoteness from the public utility grid, its abundance of sunshine, the size and diversity of its electric loads, and its accessibility to the visiting public," says a Natural Bridges brochure from the 1980s. "After its dedication in June 1908, visitors were able to view the largest PV power system in the world."

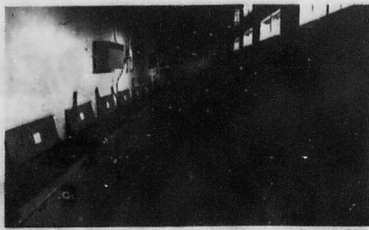
Up to that point, the monument's buildings had been powered by diesel generators, but the new system wasn't just a test of photovoltaics. It also included battery storage for nights and cloudy periods.

### SUBMARINE BATTERIES

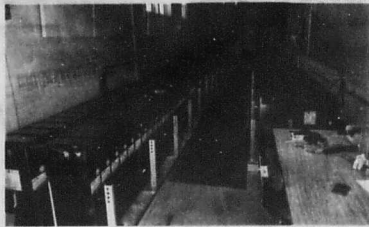
"They were submarine batteries," said Kern. "The building that housed the batteries was the size of a semi-trailer."

Because of its remoteness, the team figured it would have to have a cement plant on site, because cement in trucks would cure before they could get there.

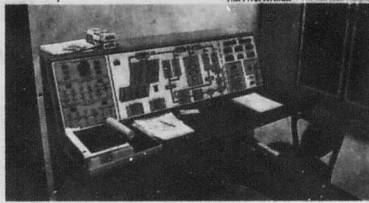
"This power system is providing information important to the successful operation of future systems: namely, data leading to improved models for system sizing and design as well as reliability, maintenance and performance data on critical PV system components," wrote Lincoln Lab's F. John Solman in a 1986 paper on the project. "The park is visited by



Natural Bridges National Monument



TIM FITZPATRICK



Natural Bridges National Monument

**Top** » Submarine batteries comprised the first generation of energy storage at Natural Bridges. **Middle** » Housed in the original battery building, all of the batteries have been updated to more modern "wet cells." **Above** » The original solar power system was managed with this console.

over 80,000 people per year and thus offers an excellent opportunity to educate the public on renewable energy sources and energy usage."

Today, the solar farm is still operating. All of the electrical equipment, including the solar panels, have been updated multiple times, but the new panels are still mounted on the original racks and timbers in a 1.3-acre section near the visitor center.

Because they're more efficient, the section has only about half the number of panels of the original.

And that battery building is still full of batteries.

### 'MAJOR PRIDE'

"I was born and raised in Utah. I have a lot of feelings for this system and what we've been able to do here,"



Source: GoogleMaps

said John Davis, maintenance mechanic at Natural Bridges who has been the keeper of the power system for the last 16 years and says it's a source of "major pride."

While the original system was said to produce 100 kilowatts when the sun was shining, it was probably closer to about 60, Davis said. The current system, which includes several generations of panels installed over the past couple of decades, operates around 47 kilowatts, although it's capable of 60. That's enough to power the visitor's center and a handful of cabins where park employees live.

The submarine batteries are long gone, replaced by more modern "wet cell" batteries that soak up excess power from the panels during the day to use at night. "By noon the next day they're recharged," said Davis.

Like the originals, the batteries give off a small amount of hydrogen. To avoid explosion, the building has ventilation fans and detectors. And the building is built with three walls of reinforced concrete and a fourth, weaker "blast wall" to send explosion debris out into empty desert. In 44 years, there has never been an explosion.

The monument still has diesel generators as a backup, and they relied on them during a few gaps when the system was shut down for lack of parts. In recent years, Davis said, they only run for two hours a night in December and January, when the sun shines for about nine hours a day. That, combined with the batteries, is enough to provide power to the smaller number of employees in winter.

Davis, who first learned how to work with photovoltaics on solar-powered irrigation well pumps

in San Juan County, has overseen the system's transformation from a one of its kind to more of an off-the-shelf system. That includes stacking nine house-sized "inverters," which change the direct-current battery power to alternating current. "The first stackable system in the United States was installed here," he said.

### COST COMPETITIVE

Given all the costs, is the system any cheaper than just running the generators? Davis thinks so. "The generators take 2.5 gallons (of diesel fuel) per hour, and you can do the math."

But for Davis' boss, facility manager Brian Maholy, it's about more than just costs. "We really should be trying to burn less fossil fuels in national parks."

And, of course, nothing stands still. The monument has funding to update the system again with new panels and inverters.

Demand for electricity rises — even in the middle of nowhere. Plans are already under way for adding electric car chargers, though that will likely be handled with a separate system that can handle fast charging.

"My system is more of a 'Let's stay cool and easy throughout the day,'" Davis said. "A car charger wants power and it wants it now."

And Maholy says they're already looking forward to a big anniversary. "When 2030 comes and we've had the solar array for 50 years, that's going to be a big thing for us."

This story is part of *The Salt Lake Tribune's* ongoing commitment to identify solutions to Utah's biggest challenges through the work of the Innovation Lab.

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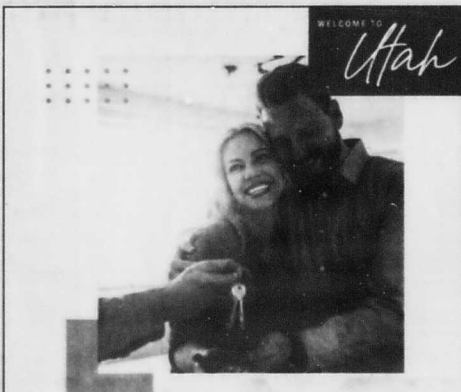
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