Case Study

DD5300: Powering Science When the Grid Goes Dark

*"The battery + solar system provides over **99%** of all site power generation requirements"*

The Background

Remote scientific research stations require continuous, reliable power, but grid infrastructure rarely extends to the wilderness environments where critical field research takes place. For facilities located in fire-prone regions of the American West, the challenge is no longer just about reaching the grid, it is about surviving without it. Delivering consistent electricity to these sites traditionally meant dependence on diesel generators, with all the associated fuel costs, carbon emissions, and logistical challenges that come with maintaining supply in isolated terrain.

Across California and the broader Southwest, utility companies have implemented Public Safety Power Shutoff (PSPS) programs that deliberately cut electricity to at-risk areas during high-wind events and elevated wildfire conditions. These shutoffs can last hours or even days, and they strike with minimal warning. For commercial and residential customers, a shutoff is an inconvenience. For a functioning research center, it can mean the loss of irreplaceable scientific data, damaged equipment, and compromised experiments.

This case study examines a standalone microgrid installation at a desert research center operating in a harsh, remote environment, where an innovative solar-plus-battery system has virtually eliminated the need for fossil fuel generation.

The Challenge

A desert research facility had experienced repeated, unplanned power loss during high-wind and fire-weather events as the regional utility enacted PSPS protocols. Each outage threatened sensitive scientific equipment that requires 24/7 power. The research mission demanded a power solution that would remain fully operational regardless of what the utility grid was doing. Diesel generators provided short-term stopgap relief but were neither sustainable nor sufficiently reliable as a long-term answer. The center needed to decouple from grid dependency entirely.

The Solution

The power solution of choice was the Deka Duration DD5300, a universal LiFePO4 lithium energy storage module engineered for scalable, off-grid and microgrid applications. Fifty-six DD5300 modules were deployed as the 296kWh battery bank, paired with a 40.7 kW rooftop solar array and the Sol-Ark inverter platform.

The system was designed around a solar-first philosophy, with battery storage as the primary energy reservoir, and dual propane generators serving only as last-resort backup, a safety net the facility has rarely needed to deploy. By operating as a true standalone microgrid, the research center became immune to PSPS and outage events while also saving money on utility bills and generator operation. Whether the utility cuts power for two hours or two days, instruments keep running, data keeps recording, and research never stops.

Battery Storage System — 56 DD5300 battery modules providing primary site power

Design Methodology

Five years of monthly kWh usage data formed the foundation of the energy model, with load assumptions built on historical averages from the utility company. Monthly site consumption averaged approximately 3,095 kWh, totaling roughly 37,140 kWh annually, with heaviest loads concentrated in June through August. The system was sized to offset 100% of that annual load through solar and storage alone, requiring the array and battery bank to cover not only typical daily demand but also extended periods of low solar production during peak summer consumption.

Component	Details
Inverters	4 × Sol-Ark 15k (SA-15K-2P)
Battery Storage	56 × Deka DD5300 Battery Modules
Solar Array	40.7 kW Roof-Mounted PV (ZN Shine 550W Modules)
Module Optimizers	Tigo TS4-A-O
Backup Generators	2 × Generac 60kW
Transfer Switch	Generac ATS
Monitoring & Control	New Sun Road Stellar Edge Platform

The Results

Since installation in December 2024, the microgrid has performed with exceptional reliability and efficiency. The system has operated entirely off-grid since commissioning, relying almost exclusively on the solar array and battery bank for all power generation. Generator runtime for the full year of 2025 came in at less than 20 hours, confirming that the load offset targets set during design were not just met, but surpassed. The DD5300 modules spend the majority of their operating life between 80–98% state of charge, a strong indicator that solar harvest consistently outpaces site demand except during the peak summer months. This is a testament to how well the DD5300 platform handles sustained high cycling and fast charging.

99%	<20 hrs	~40 MWh
From Solar + Battery	Generator Use Since Commissioning	Energy Processed by the System in 2025

Research Continuity Through Outages: The microgrid has insulated the facility completely from outages and PSPS events. The research center's instruments, sensors, and data systems continued operating without any unplanned interruption.

Future Proof for Load Expansions: The modular DD5300 architecture allows additional capacity to be integrated as research demands grow, without redesigning the core microgrid infrastructure.

Carbon Footprint Reduction: With generator runtime under 20 hours annually, the site has dramatically cut its carbon emissions, supporting the research center's commitment to environmental stewardship in a protected desert ecosystem.

Operational & Logistical Cost Savings: The project has also delivered measurable financial benefit. The site has removed the recurring costs of propane procurement, fuel delivery logistics to a remote location, and generator maintenance. Additionally, because the system was designed to fully offset site consumption, the facility is no longer drawing from, or paying for grid power.

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