avathon.

Use Case

MAXIMIZE SOLAR POWER PRODUCTION USING AI TO DETECT DC FIELD FAULTS

HOW CAN SOLAR OPERATORS REDUCE ENERGY PRODUCTION LOSS CAUSED BY DC FIELD FAULTS?

PROBLEM

Solar direct current (DC) field faults can reduce the output of a solar energy production site. On large solar sites, with multiple thousands of panels, fuses, and strings in the DC array, the task of finding and fixing DC faults becomes especially challenging and costly.

SOLUTION

Implementing an AI-powered automated step-change algorithm to detect and contextualize direct current decreases outside of normal operational bounds makes it possible to remotely assess the health of your DC array at all times.

OUTCOME

AI-enabled DC field fault detection not only pinpoints where failures have occurred through real-time monitoring and analysis, it also quantifies the resulting energy loss from each occurrence—helping to optimize your maintenance strategy and increase your annual energy production.

WHY DC FIELD FAULTS CREATE AN EXPENSIVE PROBLEM FOR LARGE SOLAR OPERATORS

Photovoltaic cells convert sunlight into direct current (DC) electricity, which is then converted to alternating current (AC) for use on the electrical grid.

Natural events such as weathering, exposure to moisture, wildlife contact, etc., can damage the array of components that make up the DC field of a solar panel plant. A persistent challenge for solar operators is ensuring that the DC field is completely operational—with no broken panels, bad fuses, grounded connections, or open switches causing energy losses.

Discovering the occasional DC field fault on smaller commercial and industrial sites is straightforward. The input into an inverter here is simple enough to check for changes or failures in current and the array during periodic preventative maintenance visits. However, at larger solar power producing sites—with solar panels numbering in the hundreds of thousands spread over several square miles—the challenge of finding and fixing DC field faults compounds quickly.

As the total number of components in the DC field proliferates across a large-scale operation, isolating individual failures can be like trying to find a needle in a haystack. One individual failure by itself may be relatively insignificant to overall energy output. At higher numbers on these larger sites, they add up to become a formidable drag on production, not to mention an increasingly expensive maintenance concern. Also, grounded cables or failed solar panels can pose a fire risk, threatening the entire site installation and the surrounding environment.

Without a reliable, scalable, and cost-effective method to detect solar DC field failures quickly, this issue can significantly impact a solar operator's bottom line, from reduced energy production to increased maintenance costs.

TRADITIONAL APPROACHES TO FINDING AND FIXING SOLAR DC FIELD FAULTS ARE INEFFICIENT

There are several traditional methods for detecting issues in the DC field. Each method has its merits, but how do they scale for large solar power operations?

Common approaches include:

- Site sweeps using technicians and a current meter
- Drone/aerial infrared scans
- Manual or rules-based data monitoring

Using technicians at large sites to sweep the site and check every DC field can be an effective method for ensuring all the issues are detected and repaired, but this approach is very time-consuming and costs thousands per day.

Due to the time and expense of manually inspecting every DC component—whether it needs attention or not—this does not make sense to do beyond periodic intervals (usually only once or twice a year).

Drone/aerial infrared scans can pinpoint precise locations that need attention before dispatching technicians for repair, especially in

A worker checks on an inverter at a large power plant.
Photo by Ken Oltmann/CoServ.

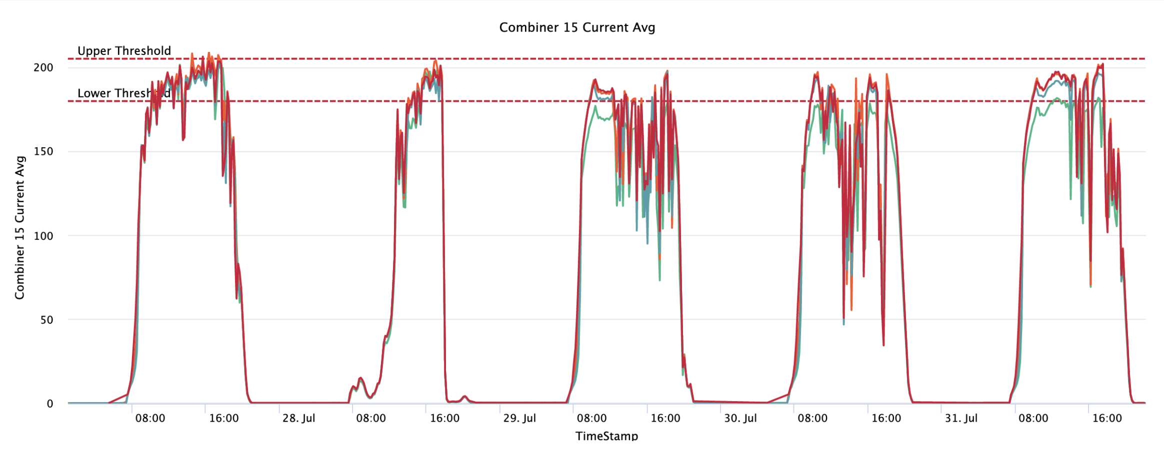

FIGURE 1:* *DC step change observed on Block 72 due to failures in the DC field.

conjunction with automated monitoring methods. However, scans such as these require an additional expense. Most operators aren't equipped to perform them regularly, and undetected faults that occur between scans lead to energy losses that pile up.

Manual or rules-based SCADA data monitoring can remotely report inverter DC input readings and changes. This is one of the better ways to monitor the DC field throughout the year. However, if the monitoring system is not finely tuned, this approach may lead to operators and technicians responding to many false-positive results and ordering a truck roll unnecessarily. Conversely, the rules-based data monitoring alone may not sufficiently contextualize the failure, leading to the operator or engineer underestimating the scale of the problem. This approach is also very time-consuming and therefore expensive to implement.

HOW AI CAN OPTIMIZE DC FIELD HEALTH

Using an automated step-change detection algorithm, you can quickly and consistently identify decreases in direct current out of normal operational bounds. Automated step-change detection algorithms are easy to operationalize with Avathon's industry-leading, AI-enabled, cloud-based SaaS platform for analytics and asset management.

Avathon can continuously process the SCADA data already available from your assets in the field. Whenever it detects an anomalous step change in your inverter DC input readings, it triggers an alert for your operator or engineer's awareness. The platform's automated performance metrics and dashboard alerts support streamlined maintenance decision-making to efficiently evaluate whether and when to send out a technician to investigate.

The platform can quantify the energy loss associated with the DC field faults using inputs such as SCADA data, fault and event data, weather data, and other relevant data sources.

INCREASING SOLAR ENERGY PRODUCTION AND REDUCING MAINTENANCE COSTS

Benefitting planning, maintenance, and logistics functions for even the largest solar power production operations today, Avathon empowers you with full-spectrum visibility, self-service analytics, custom reporting tools, forecasting, and more to find, quantify, and contextualize DC field failures 24/7.

Leveraging these capabilities enables you to maximize output throughout the year and reduce total maintenance expenses for addressing DC field faults vs. relying on periodic field sweeps and drone scans that can't give you the full picture from day to day.

Avathon has created the world's first AI-powered asset management platform for renewable energy, enabling operators to optimize the vast streams of data flowing from their assets to solve big challenges. Harness the power of AI and machine learning to optimize year-round maintenance tasks—like DC field repair—for maximum ROI.

ABOUT AVATHON

Avathon, a leader in Industrial AI, extends the life of critical infrastructure while advancing the journey toward full autonomy. Avathon's Industrial AI platform empowers commercial and government customers with scalable, secure, and value-driven solutions that enhance efficiency and resilience across heavy industry.

To learn more about how Avathon's AI solutions can unlock the power in your data, visit www.avathon.com.

Contact Avathon today at info@avathon.com