HOW CAN SOLAR OPERATORS REDUCE ENERGY PRODUCTION LOSS CAUSED BY SOILING?

PROBLEM

When solar panels are soiled, they produce less electricity, and soiling can lead to photovoltaic module damage. Soiling reduces current global solar power production by at least 3-4% annually, creating multi-billion dollar revenue losses.

SOLUTION

An optimized soiling mitigation strategy using artificial intelligence maximizes production improvement at the lowest cost, and can effectively restore photovoltaic performance and extend asset lifespan—especially when accounting for factors such as weather, cleaning costs, and ideal scheduling.

OUTCOME

AI-powered asset management platform solutions eliminate the need for expensive soiling stations, helping solar operators implement optimized cleaning intervals that maximize their energy production at the lowest possible cost.

QUANTIFYING THE COST OF SOILING

Natural accumulation of dust, pollen, dirt, algae, bird droppings, and other debris reduces the ability of photovoltaic (PV) panels to turn solar energy into electric power energy. Beside the problem of energy reduction, uneven soil patches affecting some, but not all, cells of a PV module can disrupt the flow of current throughout the entire module. That can create hot spots that eventually damage sensitive components, shortening their lifespan.

This unavoidable challenge for the solar power industry, known as soiling, leads to lost income for operators, in terms of potential revenue wasted by energy generation inefficiencies. Soiling also creates higher operating costs, from having to constantly monitor and clean their equipment, not to mention replacing damaged assets.

Factors contributing to the impact of soiling include site-specific conditions like local weather patterns and events, the remoteness of the location, and the method and frequency of cleaning. Scientists studying the problem of soiling for solar panels estimate that energy loss annually can exceed as much as 7% in parts of the United States. In more arid regions of the world, like the Middle

East, energy output reductions due to soiling can range up to 50% per year. A 2019 study estimated the global cost of PV project soiling might rise to as much as $6.4 billion by 2023, due to more extensive deployment in locations such as China and India, where solar panels tend to be positioned in highly isolated, dust-prone environments, and where electricity costs less, reducing the economic incentive to clean them more often.

LIMITS OF CURRENT SOILING MITIGATION METHODS

To measure the degree of soiling typically occurring on their panels, operators have commonly relied on soiling stations. This method uses sensors installed on a PV panel that are regularly cleaned, while 'control' panels are untouched and allowed to become soiled. The two panels are compared to learn how quickly soil builds up with and without intervention. Operators use this data to set their cleaning schedules, because they don't want to clean too often, which wastes maintenance resources, nor do they want to go too long between cleanings, which costs them energy efficiency.

The problem with the soiling station approach is twofold. First, the soiling stations add unnecessary cost to the project. Second, different parts of a large scale solar panel array collect soil at different rates. Soiling stations don't always account for this variance well.

As a result, analysis produced by soiling station data runs the risk of over or underestimating actual levels of soiling. Furthermore, unless the soiling mitigation strategy accounts for expected precipitation, an unnecessary cleaning that adds cost but does not increase production might be performed.

HOW AI CAN OPTIMIZE SOLAR PANEL CLEANING

A better solution for managing the problem of soiling over a large, and/or remote solar panel operation will take advantage of artificial intelligence (AI) technology.

Comprehensive, AI-powered asset management platforms are able to ingest the available SCADA data while also contextualizing current and future weather conditions, project capacity, power purchase agreements, curtailment protocols, and other factors. This helps solar power operators quantify the economic value of lost production caused by soiling on their projects, and how to address it in the most efficient way.

Leveraging AI and machine-learning to interpret weather forecast data, operators can better determine when a precipitation event of sufficient magnitude to clean the panels will occur. Thus, all contributory sources of data are combined with the actual cost for cleaning the panels at the project, and an optimization process provides the project operator with the optimal time to perform a panel cleaning for maximum project profitability. No soiling stations required.

CORRELATION OF SCADA DATA & SOILING STATION
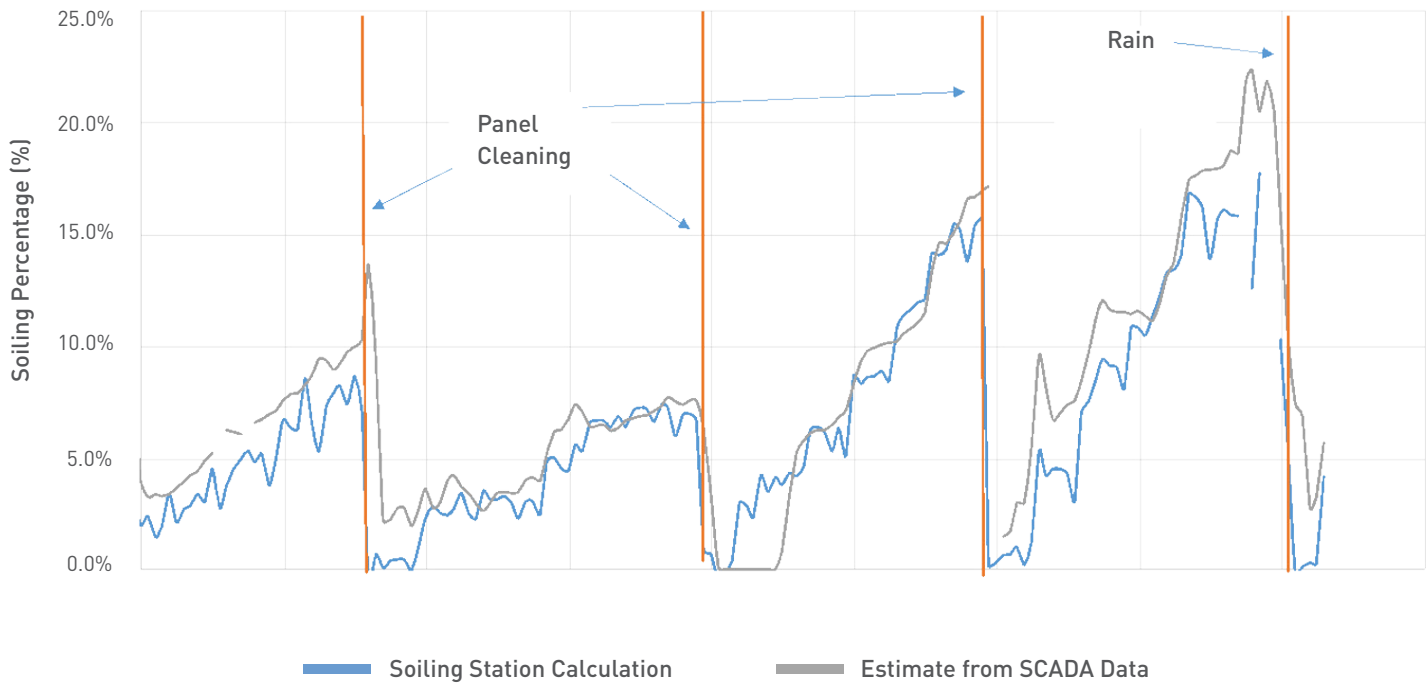
INCREASING SOLAR ENERGY PRODUCTION AND REDUCING MAINTENANCE COSTS

SparkCognition's Ensemble™ platform is the answer for renewable energy operators looking to optimize the vast streams of data flowing from their assets in order to solve big challenges like soiling mitigation.

Ensemble's industry-leading AI software helps solar energy producers put soiling conditions at their plant into clear perspective, by quantifying the effect of energy losses from soiling against the true cost of cleaning their panels more, less, or differently. The Ensemble platform enables operators to improve both planning and logistics. They can create and implement an optimal cleaning schedule that mitigates the persistent production constraint of soiling.

By continuously processing the SCADA data already available from their assets in the field (instead of relying on soiling stations), historical weather data and forecasting, and project-specific criterion like PPA details, capacity limits, and curtailment factors, SparkCognition's Ensemble platform leverages the power of AI and machine learning to optimize maintenance tasks, like cleaning solar panels, for maximum ROI.

SparkCognition helps the renewables industry increase energy production, reduce operating costs, and maximize operational efficiency with solutions like the Ensemble platform, our industry-leading, AI-enabled, cloud-based SaaS solution for analytics and asset management.

To learn more about our solutions, contact us at info@sparkcognition.com or visit our website at www.sparkcognition.com.

ABOUT SPARKCOGNITION

SparkCognition's award-winning AI solutions allow organizations to predict future outcomes, optimize processes, and prevent cyberattacks. They partner with the world's industry leaders to analyze, optimize, and learn from data, augment human intelligence, drive profitable growth, and achieve operational excellence. Their patented AI, machine learning, and natural language technologies lead the industry in innovation and accelerate digital transformation. The solutions allow organizations to solve critical challenges—prevent unexpected downtime, maximize asset performance, optimize prices, and ensure worker safety while avoiding zero-day cyberattacks on essential IT and OT infrastructure. To learn more about how SparkCognition's AI solutions can unlock the power in your data, visit www.sparkcognition.com.

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