

Voltage collapse can reduce production by more than 20%

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Voltage collapse, a significant decline in voltage levels within the DC field, is a fast-growing performance problem that affects the financial viability of many solar installations. As the voltage collapses below the inverter operating range, it hinders the inverter's ability to match the DC field voltage resulting in energy losses. In advanced cases, voltage collapse causes the inverters to frequently trip, leading to energy losses that exceed 20%.

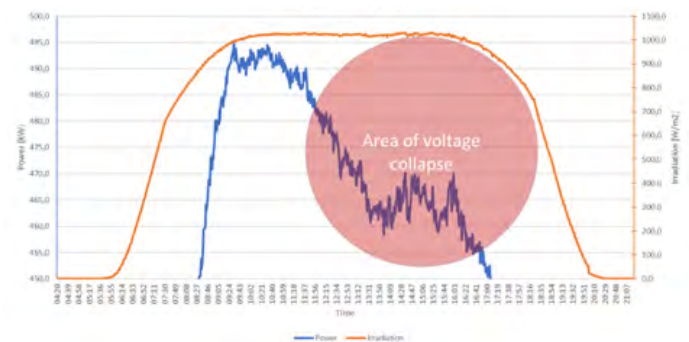
Voltage collapse is caused by various environmental factors. Systems designed for cold weather climates require shorter strings to perform on cold days. But when these systems face

the warm weather of summer, the string voltage drops below the inverter range, affecting the efficiency of the inverter. Exacerbating the problem are soiling, module degradation and the fact that we are deploying more solar in areas with extreme temperature fluctuations. As global temperatures increase, voltage collapse is becoming a systemic problem. Based on our work with leading US asset owners, Solarlytics estimates that more than 30% of all utility scale plants in the US suffer from voltage collapse. The amount of lost energy and revenue depends on the project specifics and can exceed 20% of yearly energy.

Data and Example

This is an illustration of a typical voltage collapse experienced at a site in Central California. The graph depicts the AC power output of a 500 kW inverter, represented by the blue line. Throughout the day, irradiation levels remained high and stable, as indicated by the orange line. The bubble on the graph highlights the area where power loss occurred as a result of the voltage collapse.

Figure 1. Power and Irraditaion



Voltage Collapse Affects Assets Throughout the US

There are several solutions that asset managers can take to eliminate voltage collapse:

- 1. Technical Solutions:** Use an advanced string-level monitoring and optimization system to provide a real-time view of system performance and predictive analytics to anticipate and mitigate voltage collapse events. These systems also allow the O&M manager to increase and maintain the voltage from the strings to ensure maximum inverter efficiency when there is the potential for a voltage collapse.
- 2. Proper Design and Maintenance:** Verifying proper system sizing, inverter configuration, and regular predictive and preventative maintenance are essential to mitigating voltage collapse stressors.
- 3. Continuous Monitoring:** High-frequency monitoring of system performance allows for early detection of voltage sagging and enables prompt corrective actions.

Effectively addressing voltage collapse with technology, monitoring and maintenance are key to maximize efficiency and performance of solar PV systems. Every asset owner, investor, and O&M company must take steps to understand and manage this rapidly growing issue to ensure optimal energy production and to improve the reliability of plant returns.

Figure 2. Voltage collapse occurs in all states with high installed solar PV Capacity

