Testing Methodology, Measurement, and Observation Biases: Insights from 80GW of PV field inspections

Keywords: Module reliability, symptoms vs. root cause, consulting, lifecycle fault evolution, measuring and controlling degradation, observation bias

Abstract:

Understanding PV system degradation as it relates to lifecycle fault evolution requires an integrated approach that considers multiple views of what is happening on a site to more effectively and accurately predict what can go wrong in the future. As the industry transitions from 'control what we can see' to the next phase of predictive analytics, it is increasingly important to focus on what is likely to fail, which requires a deeper understanding of what and how we measure and control for degradation. Our research findings from more than 80GW of solar aerial inspection field data, IR anomaly analysis, and root cause analysis indicate that different module manufacturers have varying rates of failure progression with system age, as well as differing trends in long-term reliability, indicating different root causes of energy loss over time. In this presentation, we will explore both the differences and the relationship between symptoms and root cause by contextualizing the impacts these issues have on current and future degradation mechanisms. Further, we will discuss how degradation observation bias can be minimized. We argue that a proactive and integrated approach leads to a more robust understanding of overall DC health, which directly impacts the ability to anticipate future causes of energy loss and degradation. This requires placing equal importance on data collection, measurement methodology, and recognizing what the data can and cannot tell us, to uncover the full story.

Executive Bio

Rob Andrews, PhD
CEO & Co-Founder, Heliolytics Inc.

Dr. Rob Andrews is the CEO and Co-Founder of Heliolytics, the global leader in aerial inspections, data analysis, and consulting for solar energy systems, with responsibility for setting the strategic direction, vision, and growth of the company.

Prior to founding Heliolytics, Rob was the principal consultant at Calama Consulting, providing expertise, resources, and guidance to help solar energy clients optimize photovoltaic (PV) system operations, plant performance, and resource management using advanced technologies.

Rob holds a PhD from Queen's University in mechanical engineering, specializing in PV system performance analytics and operational yield enhancement. He has published several peer reviewed articles on advanced system modelling, system loss assessment, and next generation yield enhancement technologies.