

Hailstorm Risk in Solar Energy: A Data-Driven Approach for Site Assessment

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Abstract

Hailstorms pose a significant and growing risk to solar energy projects, causing severe physical damage to photovoltaic modules, leading to costly repairs, financial losses, and higher insurance premiums. With the increasing deployment of large-scale solar farms across diverse geographic regions, understanding and mitigating hail-related risks has become a critical concern for developers, asset owners, and insurers. This paper presents a tool designed to estimate hail risk based on geographic location, leveraging historical storm data, meteorological records, and statistical analysis to identify high-risk areas for solar installations. By integrating this tool into site selection and project planning, stakeholders can proactively assess hail-related vulnerabilities and implement design or operational strategies to enhance system resilience. The study also discusses case studies of solar projects affected by hailstorms, highlighting instances where severe weather events led to substantial damage and financial setbacks. By improving environmental risk assessment, this research aims to enhance decision-making in solar energy development, ensuring long-term project viability and sustainability in the face of extreme weather events.

Keywords: environmental risk, hail damage, infrastructure repair, insurance, photovoltaics