



# A review of IoT-based smart energy solutions for photovoltaic systems

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## Abstract

Harnessing renewable energy stands out as the most reliable and widely accepted method to address the surging global energy needs. In particular, advancing solar energy systems requires focused efforts in operational upkeep and practical deployment. To optimize solar output, Internet of Things enabled monitoring frameworks have been introduced, enabling data collection and analysis for performance evaluation and consistent energy delivery. A core obstacle in managing energy from the consumer side lies in leveraging green power sources efficiently while keeping expenses in check and avoiding excessive energy usage. As a result, thoughtful planning is essential when integrating alternative energy technologies. Smart energy systems critically optimize consumption amid growing grid reliance. Cloud computing resolves challenges and unlocks opportunities in modern power networks. This work examines energy coordination tools' dual role in industrial operations and academic research, demonstrating their synergistic value in advancing energy efficiency and grid resilience through technological and theoretical innovation. The investigation covers comprehensive evaluations of IoT's role in solar power generation. Emerging IoT developments open new pathways for scholarly exploration, including the formulation of evaluation standards and the pursuit of novel improvement strategies. Furthermore, deeper investigations into intelligent energy systems within smart infrastructures are increasingly necessary. Such efforts are critical for enriching the knowledge base of IoT-driven solutions and promoting steady technological progress.

**Keywords** Cloud computing · Forecasting · Internet of things · Smart energy management · Photovoltaic systems · Renewable energy · Energy optimization