

Effective utilization of curtailed solar energy for powering hydrogen energy storage system: A Dynamic Optimization approach

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With an increase in solar energy penetration in the main grid, massive renewable energy curtailment poses an alarming situation. Besides that, new addition in the solar capacity tends to aggravate this situation. In this aspect, energy conversion & storage pathway such as "Power to gas (P2G)" is growing. Therefore, in this study, a hydrogen energy storage model powered by curtailed solar energy is presented to evaluate a P2G system's potential profits. The study aims to maximize the system's operating profits while considering annualized equipment, operational, and maintenance costs. The optimized operation will offer a prospective future configuration and an innovative business model. Results suggest that an increase in electrolyzer power rating will not offset the P2G profit but increase the payback period.