

THE DETERMINANTS OF MINI-GRID TECHNOLOGY DIFFUSION IN RURAL AREAS

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ABSTRACT

Mini-grid technology can provide electricity access to rural areas in India, but it faces many challenges in its diffusion. Historically, mini-grid deployments in rural India saw limited success despite substantial subsidies.

In the contemporary context, despite India affirming complete village electrification through the national grid, a new breed of private developers has pursued mini-grid deployments in rural Uttar Pradesh and Bihar with no or low public incentives.

By keeping the current milieu in the background, this study investigates the factors that affect mini-grid technology diffusion in rural areas. Firstly, it examines user-level factors, probing their socioeconomic characteristics, service and supply satisfaction levels, and the impact of pricing and competitive dynamics on their choices. Second, it investigates the private sector's capacity and viability to foster a sustainable mini-grid market in light of user-level adoption factors—finally, the role of policy incentives in promoting a rural mini-grid market in light of these findings.

This study uses three distinct datasets to explore these market developments in UP and Bihar. The two data sets are qualitative user formative research and quantitative survey data of mini-grid users—the second is operational data from private mini-grid installations.

The study applies statistical techniques to analyze the user data, such as principal component analysis, logarithmic demand estimation, and binary logistic regression. Further, it uses capital budgeting techniques, viz., discounted cash flow method, sensitivity analysis, and scenario analysis, to examine the suppliers' operational data and evaluate the role of policy incentives.

Finally, the study suggests recommendations for policymakers and private operators to advance the prospects of mini-grid advancement in the present-day realities.