

Scope, Relevance and Sustainability of Decentralized Renewable Energy Systems in Developing Economies: Imperatives from Indian Case Studies

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Abstract : "Energy for all" is a global issue of concern for the past many years. Despite the number of technological advancements and innovations, significant numbers of people are living without access to electricity around the world. India, an emerging economy, tops the list of nations having the maximum number of residents living off the grid, thus raising global attention in past few years to provide clean and sustainable energy access solutions to all of its residents. It is evident from developed economies that centralized planning and electrification alone is not sufficient for meeting energy security. Implementation of off-grid and consumer-driven energy models like Decentralized Renewable Energy (DRE) systems have played a significant role in meeting the national energy demand in developed nations. Cases of DRE systems have been reported in developing countries like India for the past few years. This paper attempts to profile the status of DRE projects in the Indian context with their scope and relevance to ensure universal electrification. Diversified cases of DRE projects, particularly solar, biomass and micro hydro are identified in different Indian states. Critical factors affecting the sustainability of DRE projects are extracted with their interlinkages in the context of developers, beneficiaries and promoters involved in such projects. Socio-techno-economic indicators are identified through similar cases in the context of DRE projects. Exploratory factor analysis is performed to evaluate the critical sustainability factors followed by regression analysis to establish the relationship between the dependent and independent factors. The generated EFA-Regression model provides a basis to develop the sustainability and replicability framework for broader coverage of DRE projects in developing nations in order to attain the goal of universal electrification with least carbon emissions.

Keywords : climate change, decentralized generation, electricity access, renewable energy

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