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Techno-Economic Analysis of Decentralized Biomass Power Plants in Developing Regions

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Abstract: *Poor rural communities could potentially access reliable, low-carbon electricity from decentralized biomass power plants. This paper presents a comprehensive techno-economic investigation of small-scale biomass gasification plants for off-grid electrification in the poor world. We simulate operating and capital costs, calculate levelized cost of electricity (LCOE), net present value (NPV), internal rate of return (IRR), and payback period based on load pattern and feedstock availability data from a case study in sub-Saharan Africa. The results are compared to grid extension and conventional diesel generation costs. Sensitivity analysis highlight the key parameters for economic feasibility. The results indicate that biomass systems can deliver lower LCOE and favorable NPV when good feedstock availability and financing terms exist.*

Feedstock price, CAPEX, and access to cheap financing all play a major role in financial viability, however. The research highlights how much support in regulation—such as carbon credits or subsidies—is needed for promoting the widespread adoption of decentralized biomass energy solutions in developing countries..

Keywords: *rural communities*

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