

# Financing the Energy Transition in Isolated Systems: Why Hybrid Solutions with Regional Biofuels Reduce Risk and Enhance Impact

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**Abstract**–The energy transition in isolated systems in the Amazon region faces structural challenges related to supply reliability, high operational costs, fossil fuel dependence and limited access to green finance. While the expansion of renewable sources such as solar energy is essential, stand-alone solutions are often insufficient to ensure energy security and financial viability in remote contexts.

This paper discusses the role of hybrid power systems integrating solar generation, battery storage and thermal units adapted to operate with regional biofuels as a strategy to reduce operational and financial risks, thereby improving the bankability of energy projects in isolated areas. The analysis focuses on the Brazilian Amazon, with particular attention to the state of Amapá, Brazil, where diesel-based generation remains dominant in several off-grid locations.

Hybrid configurations are argued to provide firm capacity, operational predictability and enhanced system resilience, which are critical factors for investors, development banks and climate finance institutions. Drawing on the experience of developing experimental and demonstrative energy infrastructure in Amapá, the paper highlights how laboratory and showroom-type facilities can act as risk-mitigation instruments by generating technical evidence, performance benchmarks and replicable operational models.

In addition, the use of regional biofuels is discussed as a transitional pathway capable of gradually reducing diesel consumption, strengthening local value chains and aligning energy projects with broader objectives of sustainable development and territorial inclusion. The paper concludes that financing the energy transition in isolated systems requires integrated technological and financial approaches, positioning hybrid systems with regional biofuels as a strategic solution to enhance economic, social and environmental impact in the Amazon.

**Keywords**–Energy transition hybrid power systems sustainable finance biofuels isolated energy systems Amazon region.