Infinity Hybrid Power Hub

By Ndegwa Chidoti

Project Title: Infinity Hybrid Power Hub

Innovator: Ndegwa Chidoti

Mission Statement

To innovate and deliver smart, sustainable, and accessible hybrid energy systems that empower off-grid communities, improve quality of life, and drive clean energy adoption through affordable technology.

Vision Statement

To become a leading force in transforming energy access across Africa and the world by pioneering intelligent, modular hybrid power solutions that are clean, reliable, and built for the future.

Abstract

The Infinity Hybrid Power Hub, developed by Ndegwa Chidoti, is a next-generation off-grid energy solution that integrates solar, wind, thermoelectric, and fuelless generation technologies into a unified, smart, and sustainable system. Utilizing a dual-axis solar tracker for maximum efficiency, a fuelless generator driven by a 775 DC motor, a 220V wind turbine, and thermoelectric modules, the system ensures 24/7 energy availability. At its core, an ESP32 microcontroller enables real-time monitoring, smart load control, and remote data visualization via the Blynk IoT platform.

This hybrid architecture not only maximizes renewable energy harvesting under varying environmental conditions but also enhances energy resilience and autonomy for rural,

disaster-prone, or underserved regions. The solution is modular, cost-effective, and scalable, targeting key applications in remote schools, health centers, farms, and emergency shelters. Aligned with UN Sustainable Development Goals (SDGs 7, 9, and 13), the Infinity Hybrid Power Hub demonstrates a pioneering model for clean energy innovation in Kenya and beyond.

Executive Summary

The Infinity Hybrid Power Hub is a smart, off-grid energy solution that combines solar (with dual-axis tracking), wind, thermoelectric, and fuelless generator technologies. Integrated with IoT (ESP32 + Blynk), it provides real-time monitoring, remote control, and optimized energy management.

1. Problem Statement

Many rural, remote, and underserved regions lack reliable access to clean electricity. Grid extension is expensive, and diesel generators are polluting and costly. There is a need for a modular, sustainable, and smart hybrid energy system.
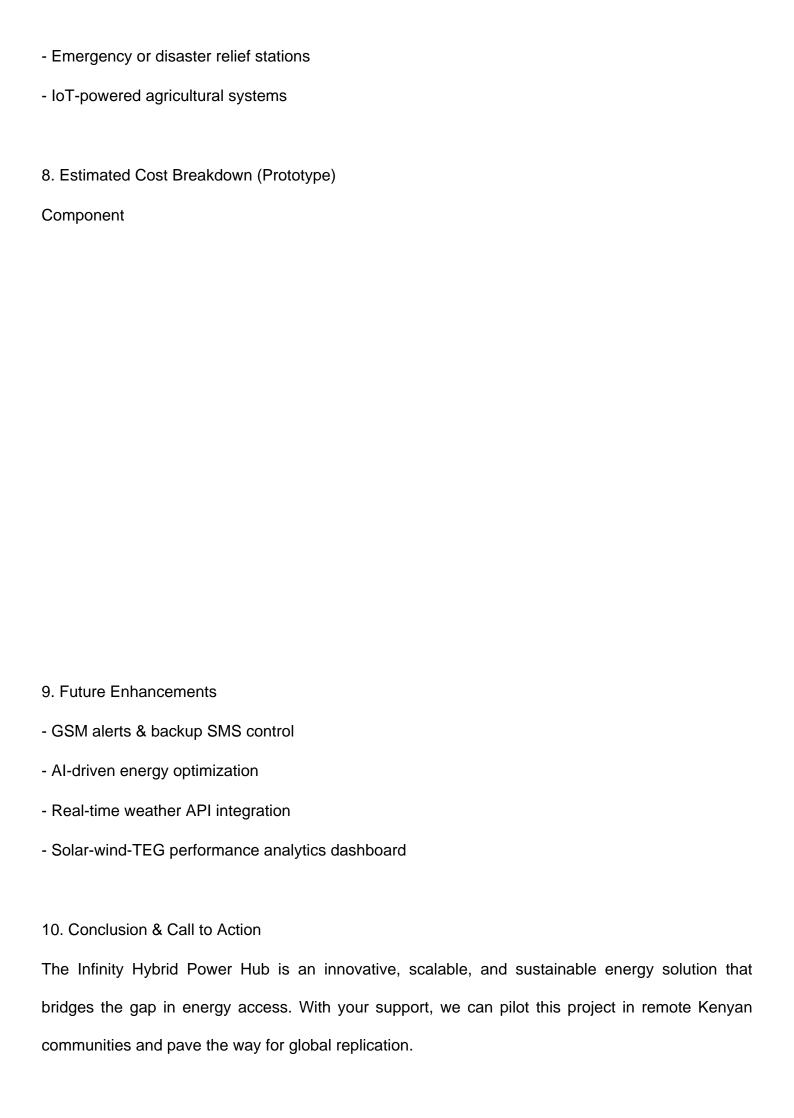
2. Proposed Solution

A hybrid energy system composed of:

- Dual-Axis Solar Tracker: Maximizes solar capture

- 775 DC Fuelless Generator: Provides rotational energy to a 310V miniature generator

- 220V Wind Turbine Generator: Captures wind energy

- Thermoelectric Generator (TEG): Harvests waste heat or environmental thermal differences

- ESP32 IoT Controller: Connects all systems to Blynk app for remote monitoring

3. System Features

- 24/7 power generation capability (day & night sources)

- Smart load monitoring & switching

- Battery SoC monitoring and charge control

- Remote monitoring through Blynk mobile/web interface

- Expandable modular design

4. Technical Architecture

- Battery System: 12V DC deep-cycle battery

- Charge Controllers: Separate MPPT/PWM modules for each input

- ESP32: Controls solar tracker, reads sensors (voltage, current, temperature), uploads data

- Relays/MOSFETs: Manage power routing and load switching

5. Estimated Daily Output (prototype)

- Solar Tracker (50W panel): ~250 Wh/day

- Fuelless Gen: ~120 Wh/day (short runtime, supplemental)

- Wind Turbine: ~400 Wh/day (depends on wind availability)

- TEG: ~50 Wh/day

- Total: ~820 Wh/day

6. Environmental Impact

- CO_2 savings (vs diesel): ~0.7 kg/day

- Zero emissions, silent operation

- Supports SDGs: 7 (Clean Energy), 13 (Climate Action), 9 (Innovation)

7. Applications

- Rural homes and schools

- Health centers and mobile clinics

- Emergency or disaster relief stations

- IoT-powered agricultural systems

8. Estimated Cost Breakdown (Prototype)

Component

9. Future Enhancements

- GSM alerts & backup SMS control

- AI-driven energy optimization

- Real-time weather API integration

- Solar-wind-TEG performance analytics dashboard

10. Conclusion & Call to Action

The Infinity Hybrid Power Hub is an innovative, scalable, and sustainable energy solution that bridges the gap in energy access. With your support, we can pilot this project in remote Kenyan communities and pave the way for global replication.

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