

CEF Sustainable Energy & Connectivity Stations

Infrastructure-Backed, Solar-Powered Solution for Remote PNG Communities



AND



1. Overview

As part of the Collective Empowerment Foundation’s (CEF) mission to deliver critical infrastructure and internet connectivity to Papua New Guinea’s most remote regions, we deploy a standardised, off-grid EcoFlow DELTA 2 Max power system paired with Starlink. This rewrite updates the system to include two (2) DELTA 2 Max Extra Batteries per station. Earlier versions referenced one Extra Battery and 4.1 kWh of storage; the upgraded configuration provides ~6.1 kWh of usable storage with the same 800 W of solar input.

Each station now comfortably supports a hamlet of ~200–300 people for “essential use” (shared Wi-Fi at the hub, basic lighting at the hub, and phone/torch charging on a roster), with greater weather resilience and service continuity between sunny periods. In line with CEF’s broader model, the system is portable, modular, and rapidly deployable, offering governments and communities a cost-effective way to extend education, health, and market access without waiting for grid extensions or diesel-dependent generators.

2. Comparison: EcoFlow + Starlink vs Traditional Cell Tower

Factor	EcoFlow DELTA 2 Max + Starlink (CEF Spec)	Traditional Cell Tower
Capital cost	~USD 4,100 per station (portable, scalable). Updated from ~USD 3,500 in prior brief to reflect 2× Extra Batteries.	USD 200,000–500,000 per tower (plus road, grid, or generator support).
Deployment time	Weeks (shipping and local setup).	1–3 years (land acquisition, approvals, construction).
Energy source	100% solar with battery storage (zero fuel costs).	Diesel or grid-dependent (high recurring fuel & maintenance costs).
Coverage model	Targeted service hubs (schools, health posts, markets) with local Wi-Fi reach.	Large radius, but requires operator investment and dense demand to be viable.
Operating cost	Minimal (basic maintenance; battery replacement after 10+ years).	High (diesel, transport, technician visits, tower leasing).
Flexibility	Portable, modular; can relocate or scale with demand.	Fixed, sunk cost; hard to adapt if demand shifts.
Sustainability	Aligned with SDGs; donor and community co-funding possible.	High carbon footprint; often reliant on subsidies.
Impact pathway	Immediate internet access, digital inclusion, health and education support.	Long-term, operator-driven commercial service (often excludes low-income/remote users).

3. Why EcoFlow (CEF configuration)?

Remote PNG deployment sites require: **portability, robustness, adequate solar recovery in wet tropics, and enough stored energy for multi-day autonomy.** The DELTA 2 Max system meets these needs while staying cost-effective and easy to service in the field. Key reasons:

- **Greater autonomy:** ~3 days of typical use with **6.1 kWh** storage, up from ~2 days in the one-battery configuration.
- **Rapid solar recovery:** 800 W of portable panels sized for tropical PNG conditions.
- **Proven, modular platform:** Simple to expand, relocate, and maintain as community needs evolve.

4. System Specifications & Price

Component	Specification
Starlink	Starlink Standard (community Wi-Fi hub)
Main Battery	EcoFlow DELTA 2 Max (2,048 Wh)
Extra Batteries (EBs)	2 × DELTA 2 Max Extra Battery (2,048 Wh each)
Total usable capacity	6,144 Wh LiFePO ₄ (designed for ~10 years of daily use before ~80% capacity)
Solar input	2 × 400 W EcoFlow portable panels (800 W)
Inverter output	2,400 W AC (surge 4,800 W), pure sine wave
Warranty	5 years

Item	Price (USD)
Starlink	\$270
EcoFlow DELTA 2 Max	\$581
2 × 400 W EcoFlow Portable Panels (800 W)	\$584

2 × DELTA 2 Max Extra Batteries	\$1,162 (= \$581 × 2)
Shipping & Installation	\$1,000–1,500
5-Year Warranty	Free
Total Cost (maximum)	\$4,097 USD (indicative; updated from \$3,516 with one EB)

5. System Real-World Performance

Daily energy demand (unchanged usage assumptions):

- Starlink (≈12 h/day): **~1.2 kWh**
- LED hub lights, phones & devices: **~0.5–0.8 kWh**
- **Total daily use: ~1.6–2.0 kWh.**

Daily solar generation (unchanged array):

- Tropical PNG: **≈5 peak-sun-hours/day**
- **800 W × 5 h × 75% system efficiency ≈ ~3.0 kWh/day.**

Storage & recharge (updated):

- **Usable storage: 6.144 kWh** (Main 2.048 kWh + 2 × EB 2.048 kWh).
- **Full-sun recharge from empty: ~9.6–11.0 hours** (6.144 kWh ÷ effective ~600 W).
- **Energy balance at site: still ~1.0–1.4 kWh daily surplus** in typical conditions; larger storage increases reserve days, not daily generation.
- **Expected autonomy: ≈3 days** of typical use (vs ≈2 days previously), improving continuity through overcast spells.

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