

# SOLAR



**UNPLUGGED: THE NEW ELECTRICITY PARADIGM**

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# Electrifying Papua New Guinea: Challenges and Opportunities for Decentralized Solar Power

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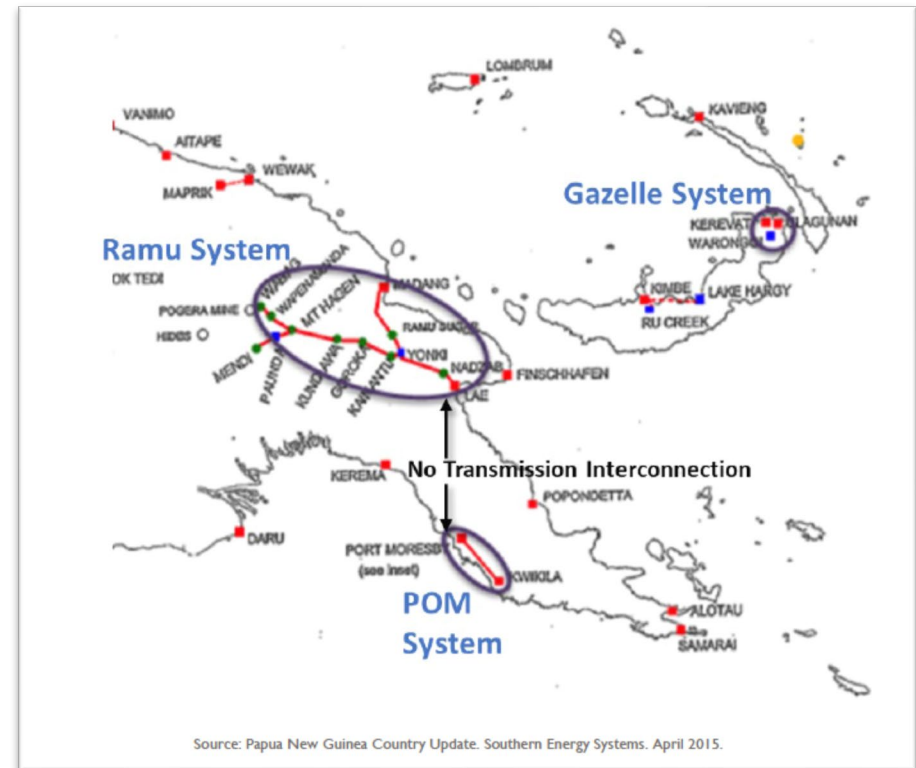
Advisory Board Vice Chair, United Nations Climate Technology Centre and Network

Martin Davies

WLU, UPNG, ANU, INA

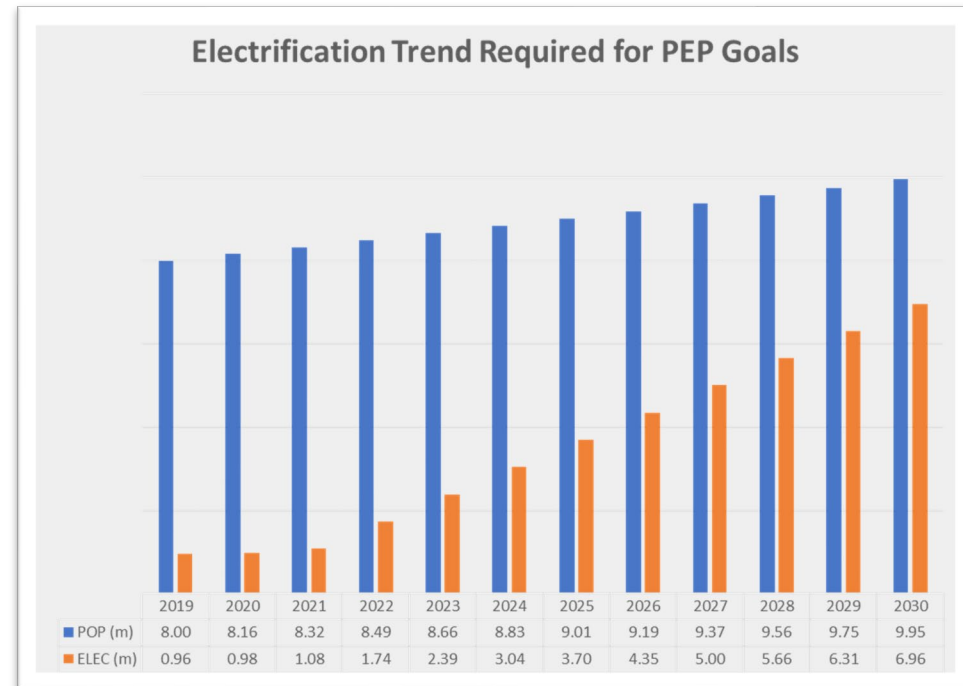
# Structural Barriers

- PNG Power Ltd insolvent, deterring private investment
- No sovereign guarantees for IPPs
- Fragmented grids: 3 main + 14 mini-grids
- 97% land under customary tenure → complex projects



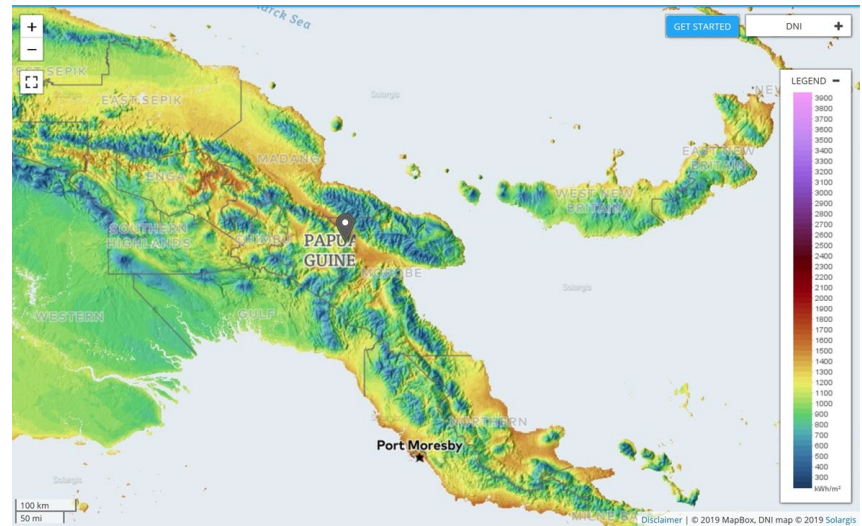
# Development Policy Implications

- Grid expansion cannot achieve 70% access by 2030
- Aid risk: stranded assets if funds back central grid
- Reframe electrification strategies around decentralized solar
- Match solutions to PNG's geography & governance reality



# Why Decentralized Solar Works for PNG

- Abundant sunshine: >5 kWh/m<sup>2</sup>/day
- Least-cost option for rural villages
- Fast deployment vs grid build-out
- Distributed, resilient systems → fewer outages



# Demand and Existing Base

- ~280 MW of existing off-grid capacity (mostly diesel)
- Households already spend heavily on kerosene & batteries
- Private sector growing (e.g. Sola PayGo, 20,000 PAYG customers)
- Latent demand → clear market foundation



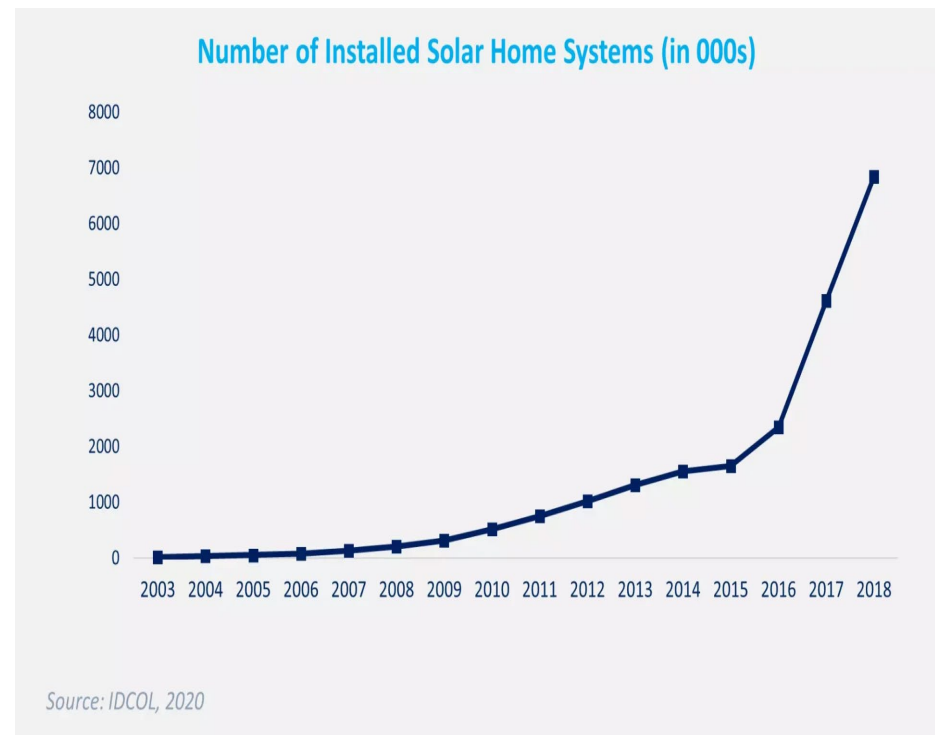
# Key Risks of Decentralized Solar

- Affordability: \$500–700 kits out of reach for most households
- Financing gaps: weak PAYG, limited microfinance coverage
- Technical risks: poor-quality imports, limited technicians
- Regulatory gaps: licensing, PPL exclusivity unresolved
- Social risks: theft, vandalism, disputes over benefits



# Bangladesh SHS Program

- Launched 2003, led by Infrastructure Development Co. Ltd (IDCOL)
- Combined microfinance + donor-backed subsidies
- Partnered with NGOs/private firms for sales, service & monitoring
- Over 4 million systems installed by 2018 → 20 million people electrified
- Lesson: Strong financing + institutional coordination = scale



# India Productive Use of Energy

- Dual approach: massive grid expansion + solar mini-grids
- Gov't subsidies (30–50%) + clear exit strategies for operators
- Focus on productive uses (irrigation, rice mills, cottage industries)
- Outcome: Near-universal electrification by late 2010s
- Lesson: Policy clarity & livelihood impact drive adoption

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अब सोलर से आटा चक्की चलाना हुआ और भी आसान सोलर पैनल की रेट में भारी गिरावट फाइनैस पर उपलब्ध है

# East Africa Mobile Money

- PAYG model linked to mobile money (M-Pesa) revolutionized access
- Firms: M-KOPA, Zola, Mobisol, Fenix International
- By 2018: 600,000+ PAYG systems sold in Kenya (M-KOPA alone)
- Kenya electrification rose 27% → 75% (2013–2018)
- Lesson: Digital finance + quality assurance + venture capital = scale



# Pacific Island Experience

- Fiji, Tonga, Vanuatu and Tuvalu have had programs since the 1980's
- Early failures: lack of maintenance & replacement funds
- Shift to fee-for-service models managed by utilities
- User fees + donor/government support for sustainability
- Institutionalized technician visits & centralized maintenance
- Lesson: Community engagement + external maintenance = sustainability

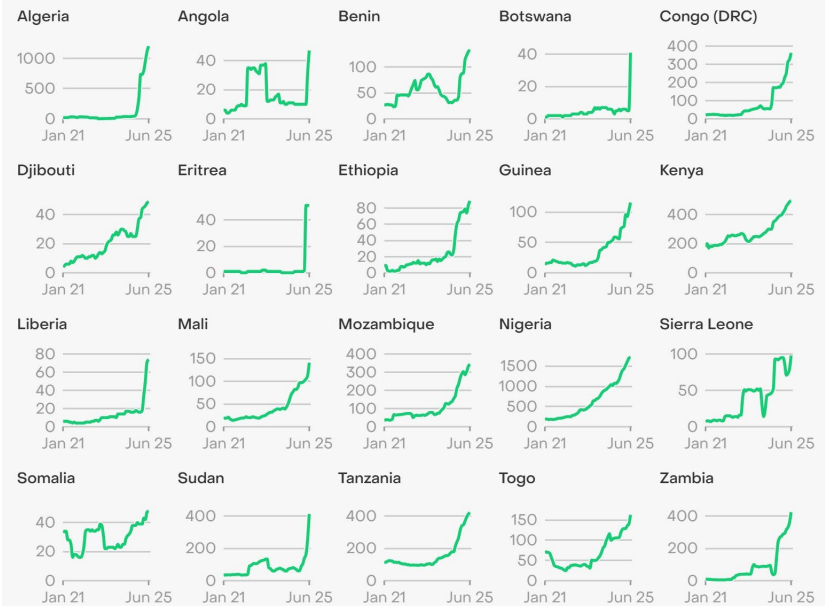


# The 2025 Solar Surge

- **Record surge:** 20 African countries hit all-time highs in PV imports (rolling 12 months to Jun 2025).
- **Broad-based:** Standouts include Nigeria, Kenya, Tanzania, Ethiopia, Mozambique, Zambia.
- **Price shock:** ~40% drop in Chinese module prices in 2024 unlocked demand.
- **Where panels are going:** C&I rooftops, mini-grids, and PAYG/SHS channels.
- **Why now:** Unreliable grids + costly diesel + relatively low import frictions.
- **Upside:** Faster electrification, thousands of installer/technician jobs, cheaper daytime power.
- **Watch-outs:** Sub-standard gear, weak O&M, and rising e-waste without take-back schemes.
- Similar Scenario preceded this in Pakistan

## 20 African countries imported a record amount of solar panels in the 12 months to June 2025

Rolling 12 months imports of solar panels from China, megawatts



Source: China's Solar PV Export Explorer · Four additional countries also set a record in June, but for very low volumes (Congo, Equatorial Guinea, Eswatini, Saint Helena).

EMBER

# Financing & Affordability

- Smart subsidies for poorest households (vouchers/50% grants)
- Expand microfinance loans with donor credit guarantees
- Strengthen PAYG solar via telecom partnerships
- Tap climate finance to lower consumer prices



# Technical & Institutional Capacity

- Fund training programs for solar technicians & village electricians
- Enforce Lighting Global/VeraSol standards for product imports
- Establish regional service hubs & mobile maintenance teams
- Require donor-funded projects to include 5+ years of O&M



# Policy, Regulation & Community

- Approve NEA's off-grid regulation for clarity on tariffs & licensing
- Reform PPL monopoly → allow private/community providers
- Ensure systems are grid-compatible where future integration is likely
- Support community ownership models (co-ops, trusts)
- Strengthen consumer protection in PAYG & cash sales

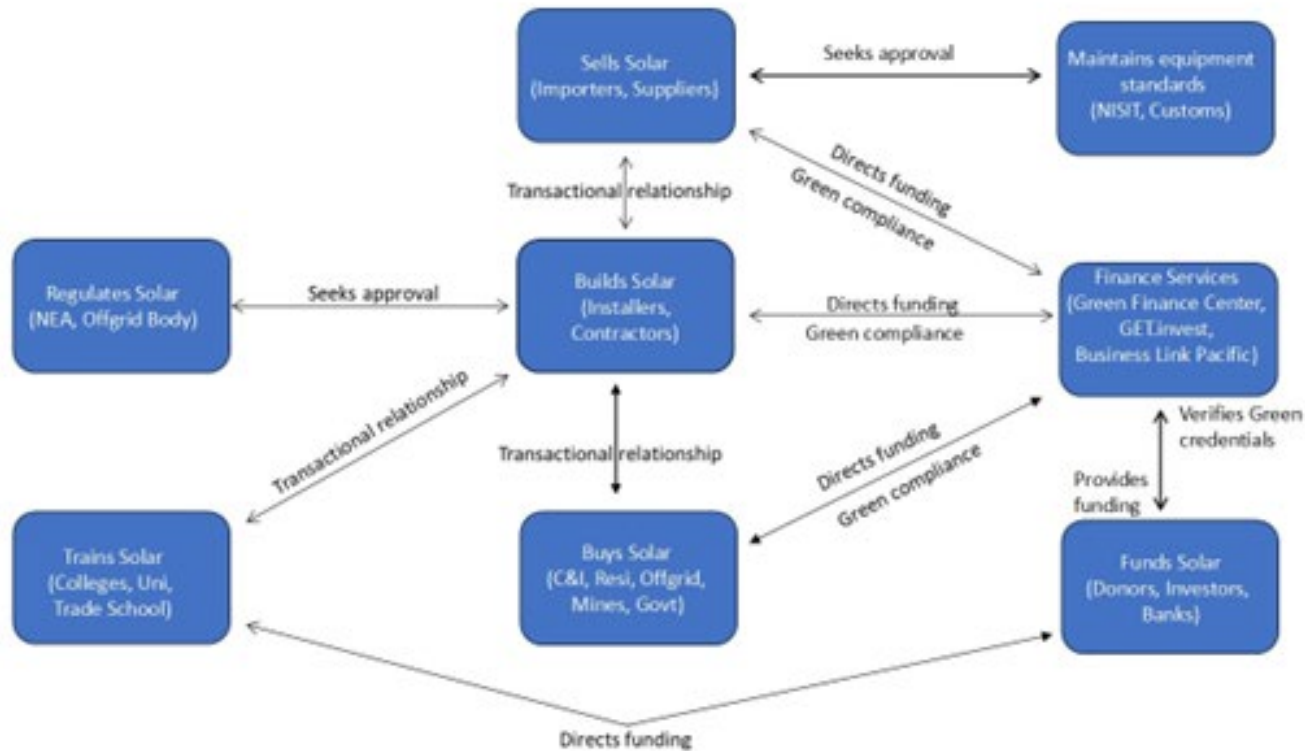


# Development Implications

- Enabling environment requires donor, government, and private sector alignment
- De-risk household adoption through finance & subsidies
- Build technical ecosystems for long-term sustainability
- Push regulatory reforms that unlock private investment
- Without these, decentralized solar will not scale



# A Model for PNG?



## Industry wants:

- Forex relief
- Clear Regulations
- Tariff Reform
- Digital Infrastructure
- Banked Population
- Skilled Workforce
- Public Sector Guarantor



# Closing Message

- Grid expansion won't deliver 70% electrification
- Decentralized solar is faster, cheaper, more resilient
- Development partners can enable the finance–capacity–policy nexus
- Electrification is a development, diplomatic, and economic opportunity

