

MICROGRIDS – A SOLUTION FOR ELECTRICITY ACCESS IN THE PACIFIC ISLAND COUNTRIES?



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Sustainable Development Goals

Access to affordable, reliable, sustainable and modern energy for all by 2030 (SDG 7).

- Worldwide over 1 billion people do not have access to electricity, over 3 billion people cook with polluting, inefficient fuels



Sustainable Energy for All (SEforALL)

- Ensure universal access to modern energy services;
- Double the global rate of improvement in energy efficiency; and
- Double the share of renewable energy in the global energy mix.



Picture source: energyeducation.ca, wired.com

The World Bank Group – Entities and Operations



Solution for sustainable access to electricity in Pacific

Priorities

- Affordable for low income consumers (households and businesses)
- Supply to meet both household and business needs, now and in future
- Balance between service levels and price of electricity
- Commercially viable operations
- Private sector delivery models

Preferred solution

- Grid based or interconnected systems, tamper proof
- Small, scalable, renewable energy systems – future proofed
- Low maintenance, limited intervention, low skill requirements for O&M
- Low cost monitoring, billing and collection systems – remotely

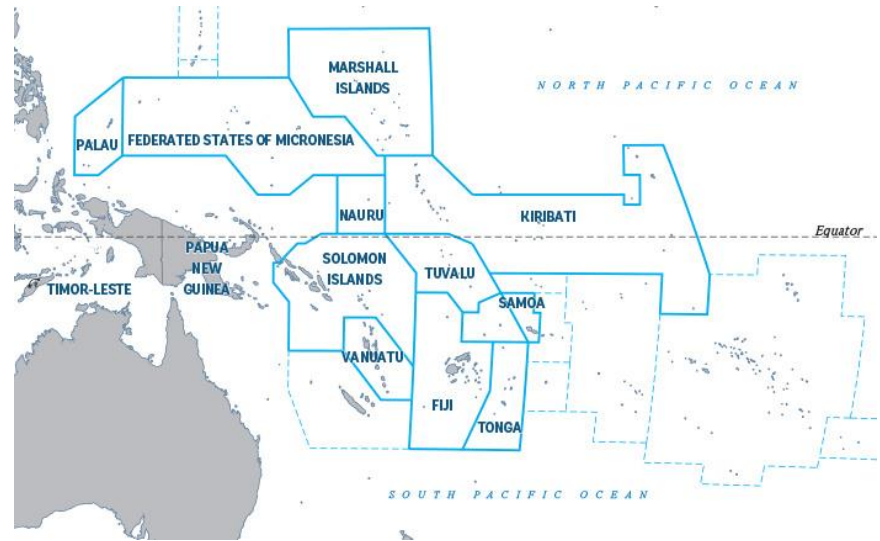
“integration of energy, communications/IT and banking (remote)”



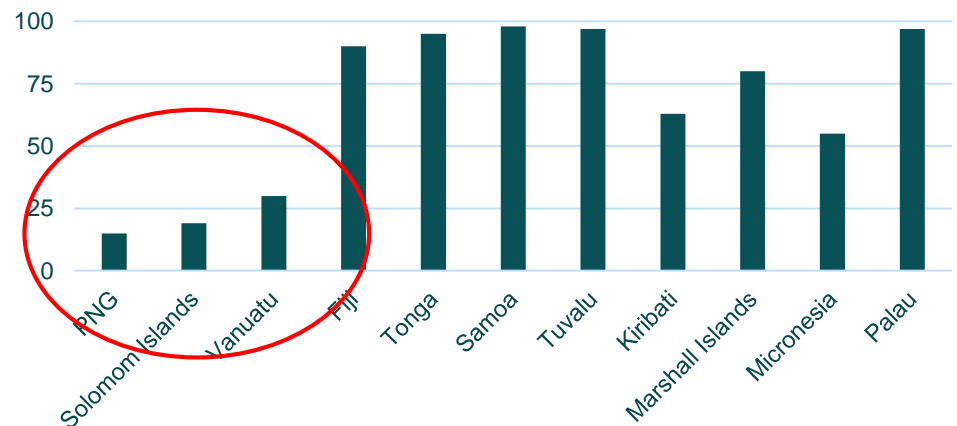
Picture source: SHENZHEN INHEMETER CO., LTD

World Bank Group (WBG) Pacific Energy Operations

- 13 countries, 10 million people, 2.2 million people excl. PNG and TL. 8 PICs have populations well below 200,000 people
- Small population centres dispersed over 100's of islands. (PNG 600, SI 900, Vanuatu 83)
- 75-80% of Pacific Islanders do not have access to electricity
- Total installed capacities in the islands vary from a low of 3MW in Tuvalu to 370MW in PNG – typically between 5 to 20MW



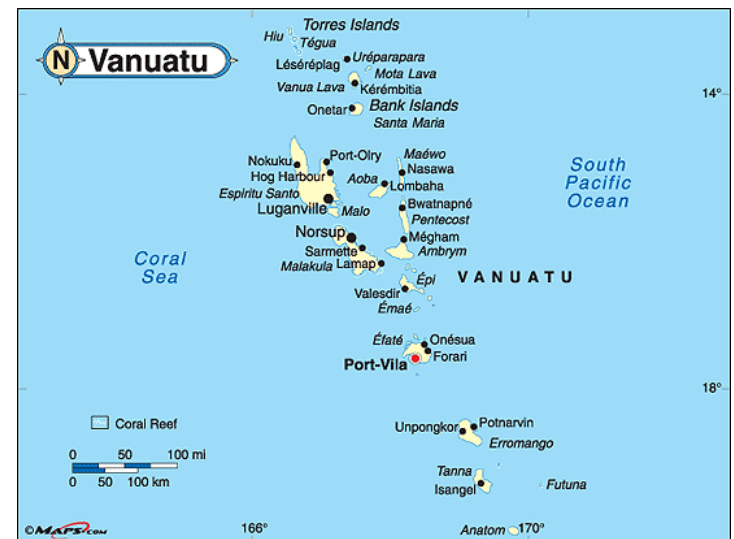
Energy Access %



Abbreviations: PIC - Pacific Island Countries, PNG - Papua New Guinea, TL - Timor-Leste, SI - Solomon Islands

Access and Energy Sector Challenges

- Dispersed, remote communities with limited access to technical expertise – isolated from main centers
- Relatively small energy demand, small systems, technology & operating risks – markets thin
- Low institutional capacity (policy and people), weak supply chains, small private sector, community land ownership
- Low, seasonal incomes, lack of credit history of users
- Limited access finance for borrowers and to working capital for suppliers



Maps: Maps.com, Lonely Planet

Energy Access Options

- Mini/micro grids:
 - Utility models for larger population centers
 - Purchase options for smaller single user applications
- Solar Home Systems (SHS) for dispersed communities
- “Plug and Play” systems for the very remote isolated homes and businesses

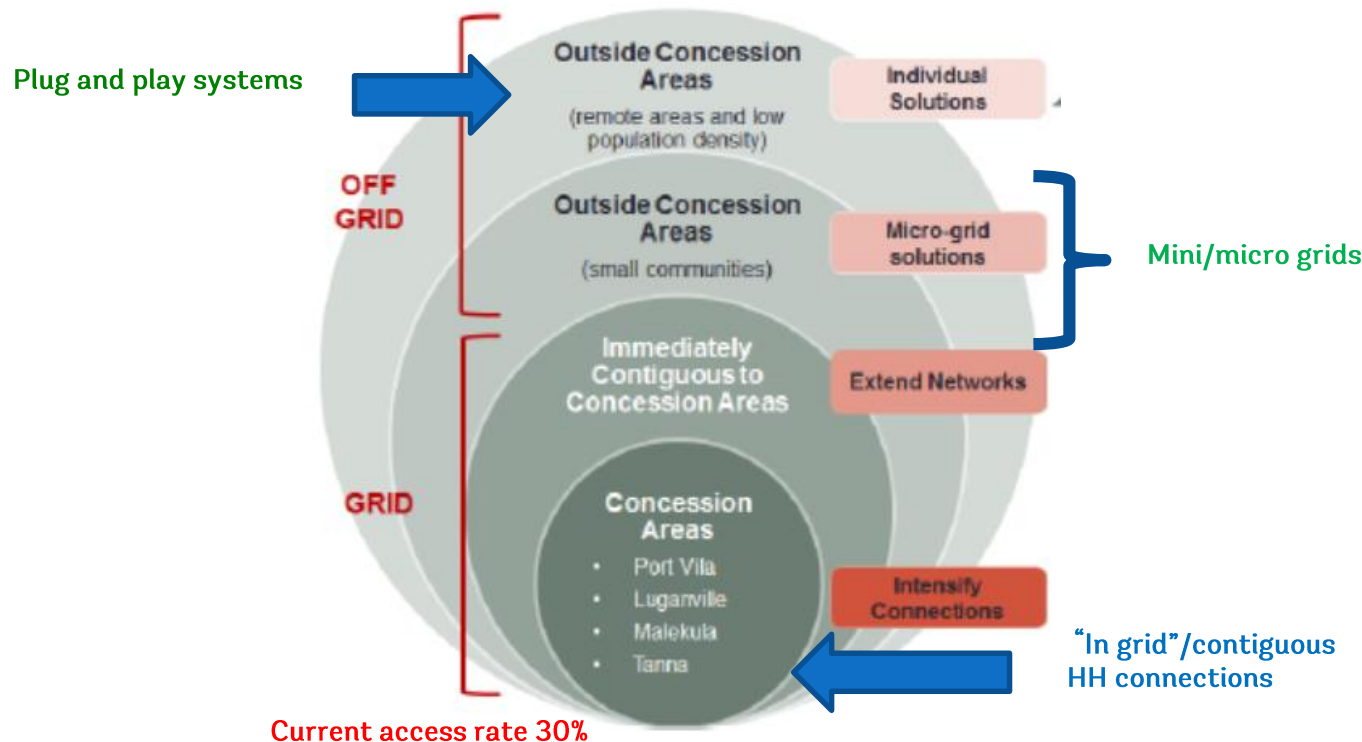


Source: IRENA



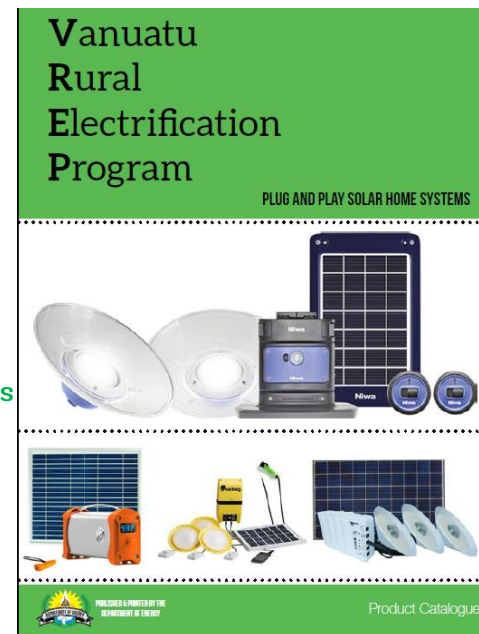
Photos: Courtesy DoE, Vanuatu and Fiji

Example: Energy Access Framework for Vanuatu



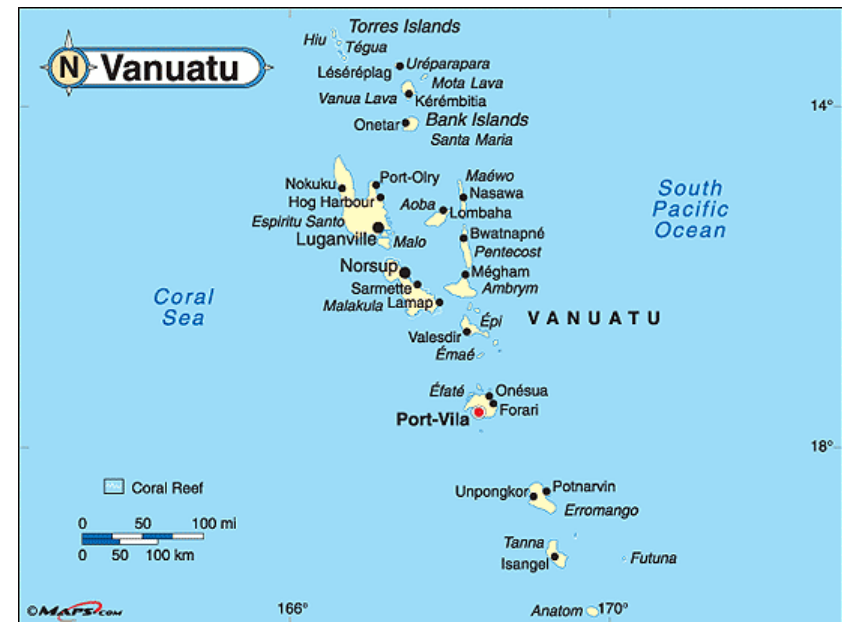
Private sector delivery models

Photos: Courtesy DoE, Vanuatu
Diagram: Vanuatu National Energy Road Map



Vanuatu in Focus

- **The Republic of Vanuatu** is an archipelago of 82 volcanic islands (65 inhabited) covering 12,000km²
- Vanuatu's population: approximately **290,000 people**
- National household count: approximately **55,000**:
 - 13,750 households located in urban areas
 - 41,250 households dispersed across rural areas
- Average household monthly income:
 - Urban households: 97,500 vatu (USD 971 / AUD 1,206)
 - Rural households: 79,500 vatu (USD 792 / AUD 984)
- Average female-headed household monthly income:
 - Urban: 85,200 vatu (USD 849 / AUD 1054)
 - Rural: 51,200 vatu (USD 510 / AUD 633)



Maps: Maps.com, Lonely Planet

Vanuatu Energy Sector in Detail

- Of the 65 inhabited islands only 4 have grid-electricity, and this is largely restricted to urban centres.
- Grid electricity is supplied by two private companies – **UNELCO** and **VUI**, with a total installed capacity at 30.7 Megawatts. UNELCO and VUI are regulated by the Vanuatu Utilities Regulatory Authority.
- An estimated 30% of households and public institutions have access to grid-electricity and the number of people without access to any form of electricity remain high:
 - Efate – 24% Santo – 65%
 - Malekula – 84% Tanna – 86%.
- People without access to electricity in rural areas range from 83% - 97%.
- Vanuatu's rural population usually access electricity through diesel generators or solar kits. Some are supplied by small micro-/ mini-grid systems.

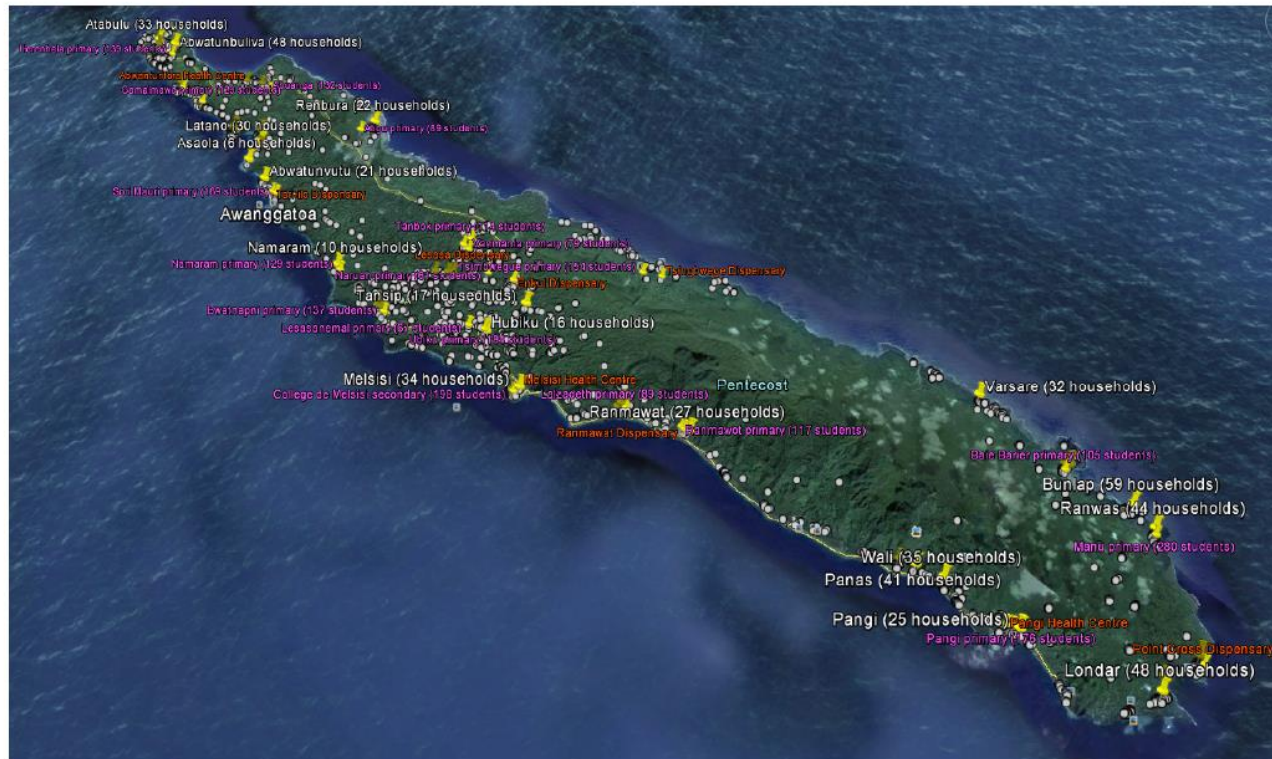


Vanua Lava Island

Total villages = 30 villages (3110 population / 587 households)

Largest village = 128 households (591 population)

Pentecost Island Vanuatu



Pentecost Island

Total Villages = 278 (18809 population / 4035 households)

Largest Village = 69 households (297 population)

Ambae Island, Vanuatu



Ambae Island

Total Villages: 105 (11061 population / 2376 households)

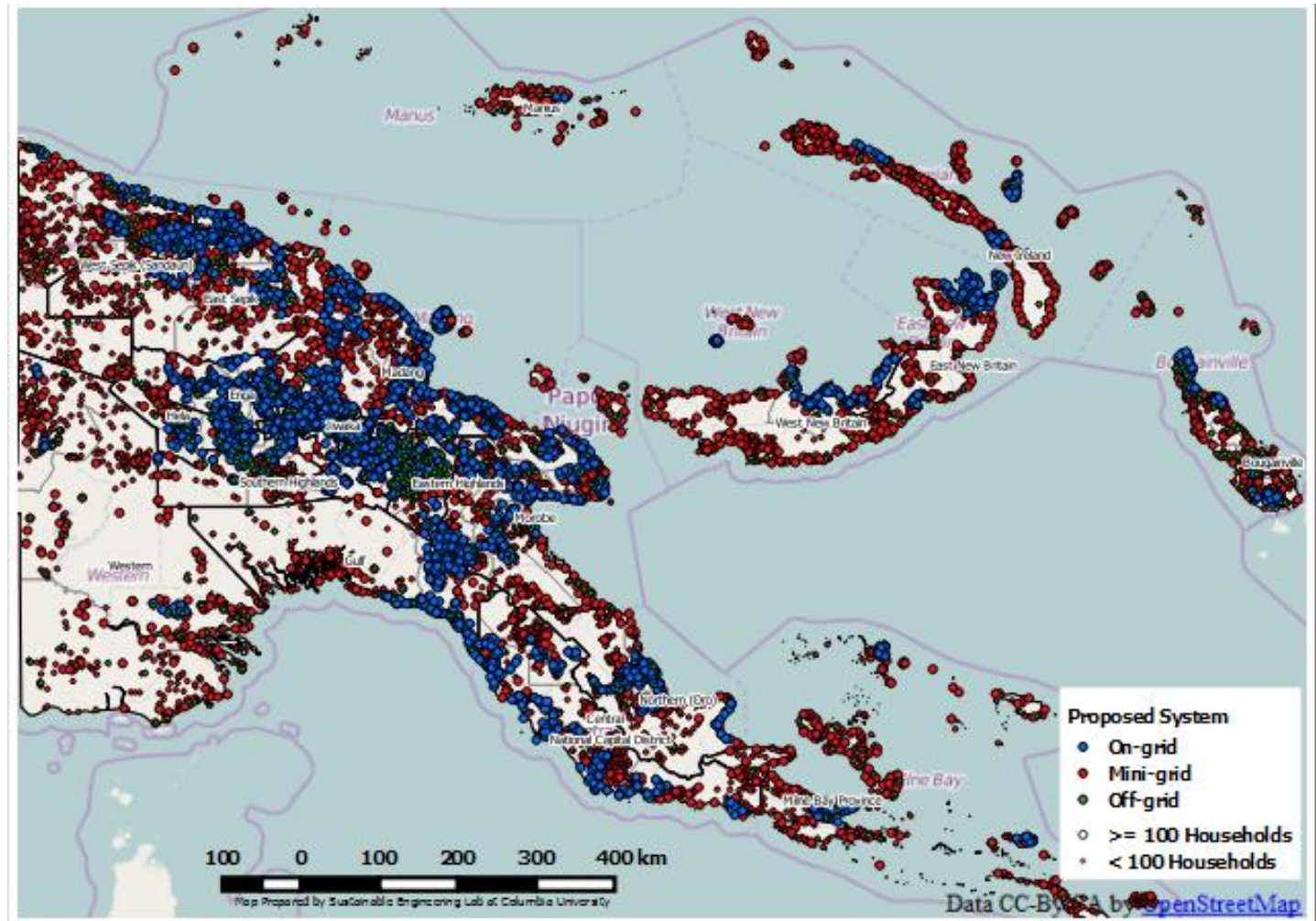
Largest Village = 65 households (275 population)

Prospects in PNG – preliminary findings

Grid for more densely populated coastal & highland areas

Mini-grid for sparsely yet sufficiently populated areas & islands

Off grid recommended for sparsely yet densely populated areas & islands



Summary mini/micro grid solutions - framework

- Private sector operating models for sustainability (financial and operational)
- Scalable to meet increase in demand, initially 1.2kWh/day, 30 – 40 kWh /month per household
- Low costs to match the users capacity to pay - around US\$20-30/month
- Community engagement to address land issues
- Social and environmental approaches to minimise impact



Source: Maps.com

Summary mini/micro grid solutions - technological

- Low cost, proven and available
- Service levels and operating duty targeted to affordability
- Remotely operated and managed systems on appropriate platforms



Source: pitara.co.



Source: anorak.co.uk

- Periodic maintenance with basic on-site support
- Pre-payment/Pay As You Go (PAYG) systems
- Others?



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