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

- **International Bank for Reconstruction and Development**
  - Loans to middle-income and credit-worthy low-income country governments

- **International Development Association (IDA)**
  - Interest-free loans and grants to governments of poorest countries

- **International Finance Corporation (IFC)**
  - Solutions in private sector development

- **Multilateral Investment and Guarantee Agency (MIGA)**
  - Guarantees of foreign direct investment’s non-commercial risks

- **International Centre for Settlement of Investment Disputes (ICSID)**
  - Conciliation and arbitration of investment disputes
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

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
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.

Source: Google maps, World Bank and DoE, Vanuatu
Pentecost Island Vanuatu

Pentecost Island
Total Villages = 278 (18809 population / 4035 households)
Largest Village = 69 households (297 population)

Source: Google maps, World Bank and DoE, Vanuatu
Ambae Island, Vanuatu

Ambae Island
Total Villages: 105 (11061 population / 2376 households)
Largest Village = 65 households (275 population)

Source: Google maps, World Bank and DoE, Vanuatu
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

Source: The Earth Institute Columbia University, Sustainable Energy Lab
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

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

Source: pitara.co.

Source: anorak.co.uk