Mini-grids and the Arrival of the National Grid

United Nations Foundation
How some off-grid renewable energy projects have adapted to grid arrival

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18 July, 2018
Mini grid options after arrival of the main grid

- Small Power Distributor (SPD)
- Small Power Producer (SPP)
- Both SPD and SPP
- Separate systems in the same village
- Buyout by utility
- Assets abandoned
Arrival of the main grid

Key:

- = power from utility
- = power from SPP
M = meter
Arrival of the main grid

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Small Power Distributor (SPD)

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- = power from utility
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Cambodia: from isolated mini-grid to SPD

+ >250 mini-grids became SPDs
+ Electricity Authority of Cambodia (EAC) put in place a comprehensive program:
  - Long-term distribution licenses required...
    To acquire one a mini-grid must:
    - Invest in utility-quality distribution network
    - Extend network thru service territory
  - Grants and loans
  - Retail tariffs standardized and cross-subsidized for distribution franchisees.

Key:  = power from utility  = power from SPP  = meter
Small Power Producer (SPP)

Customers

National Grid

Large Plants

Key: = power from utility = power from SPP = meter

Mini-Grid

Small Power Producer
Sri Lanka: from isolated mini-grid to SPP (sometimes)

+ >250 isolated community-owned hydropower built with financial support from GoSL, GEF and World Bank

+ With arrival of national grid >100 mini-grids abandoned

+ Three projects: 12 to 45 kW converted to SPPs
  - Five more in pipeline
  - No longer provide retail sales to village

Key:
- = power from utility
- = power from SPP
= meter
Both SPP and SPD

- **Customers**
  - House icons

- **National grid**
  - Arrows and icons

- **Large plants**
  - Factory icons

- **Mini-grid**
  - Arrows and icons

- **Small power producer (SPP)**
  - Windmill icon

- **Power from utility**
  - Directional arrow

- **Power from SPP**
  - Directional arrow

- **M = Meter**

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(Chart diagram showing the flow of power from utility to customers through national grid, large plants, mini-grid, and small power producer, with indicators for power source and meter.)
Indonesia: SPD + SPP

Of 200 community-owned mini-grids where national grid has arrived...

- 150 abandoned, PLN takes over.
- 9 have become SPPs/SPDs.
  - Sell all or some electricity to national grid
Co-existence

Customers
National Grid
Large Plants

Extension of National Grid

Customers
Mini-Grid
Small Plant
Buyout

Customers

National Grid

Large Plants

Small Power Producer (may operate as emergency backup plant)

Key: ← = power from utility ← = power from SPP M = meter
Assets abandoned

Customers

National Grid

Large Plants

Extension of National Grid

Small Power Producer
Lessons

+ **Viable examples of formerly isolated village mini-grids connecting to main-grid exist...**
  - Hydropower able to remain financially viable selling wholesale to utility (Sri Lanka & Indonesia)
  - Mini-grids with utility-grade distribution networks transitioning to small power distributors (Cambodia)

+ **... but are rare**
  - Most mini-grids abandoned when utility arrives

+ **Cost of interconnection depends on business model**
  - (e.g. SPP interconnection more costly than SPD)
A Guidebook on Grid Interconnection and Islanded Operation of Mini-Grid Power Systems Up to 200 kW

Chris Greacen
Richard Engel
Thomas Quetchenbach

April 2013

From the Bottom Up
How Small Power Producers and Mini-Grids Can Deliver Electrification and Renewable Energy in Africa

Bernard Tenenbaum, Chris Greacen, Tillak Sijambalapitiya, and James Knuckles

Mini-Grids and Arrival of the Main Grid
Lessons from Cambodia, Sri Lanka, and Indonesia

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Thank you

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