Private Sector Mini-Grid Business Models: Lessons learnt from South-East Asia

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- Risk Mitigation for Mini-Grids
- Case Studies from ARE Members

Credits: ASEP Philippines
The Alliance for Rural Electrification (ARE) is an international business association with the aim to promote a sustainable decentralised renewable energy industry for the 21st century, activating markets for affordable energy services, and creating local jobs and inclusive economies.

ARE had more than 130 Members at the end of 2018.

More information: ruralelec.org/matchmaking-platform
ARE Members
ARE Members and Services

ARE helps on **sector coordination and development** by:

**Service Line 1:** Market Intelligence & Business Services

**Service Line 2:** Policy & Advocacy

**Service Line 3:** Individual Support
ARE Partnerships

**Commercial Partners**

- **2013:** Africa-EU Energy Partnership
- **2014:** RECP, giz
- **2015:** European Commission, Rockefeller Foundation
- **2016:** Interreg Logic
- **2017:** IDB, RES4Africa
- **2018:** ADB, Renewable Energy Development Bank Group

**Knowledge & Support Partners**

- **2013:** RAEL, IEC, ICC Belgium, SMART VILLAGES
- **2014:** ADF, GOGLA, ALER
- **2015:** GOGLA, Bloomberg, Ren21
- **2016:** Misia, REA, UNIDO
- **2017:** ADB, IEA, Power For All
Status Quo: Energy Access in South-East Asia

- **339 million people** are without access in South and South-East Asia.

- To achieve energy access for all by 2030, **52 billion USD per year is needed**.

- Current investment of **30.2 billion USD per year** is not enough.

**Estimated addressable market for electricity access solutions (2019)**

Source: BloombergNEF estimates based on World Bank data for income distribution.
To achieve full electricity access South and South-East Asia by 2030:

- 44% of additional generation will have to come from mini-grids (MiA, 2017)

- 2,200 mini-grids planned for installation in South and South-East Asia by 2030 (ESMAP, 2019)

- Net profit potential across all mini grid component and service suppliers in 2030 alone of USD 4.7 billion (globally) (ESMAP, 2019)
The Billion Dollar Opportunity for Clean Energy Mini-Grids (2/2)

- South and South-East Asia has an enormous potential to replace or hybridise existing diesel gensets with hybrid mini-grids especially for productive uses such as rural industry and agriculture.

- Example: An estimated USD 7 billion is spent annually on diesel consumption for productive uses in India. (BNEF 2017)
Mini-grids Internal Rate of Return (IRR) is usually 10 to 15% - significantly lower than the 20% a typical investor would expect from on-grid projects.

To resolve this challenge, **two main options are available** for private mini-grid developers:

**Option 1:** Improve the IRR to compensate for the higher risk (by increasing tariffs for end users)

**Option 2:** Reduce the risks of the project (by reducing risks along the whole value chain of the mini-grid project)

**Difficulties with option 1:**
• Tariffs are often regulated on a national level
• Moral dilemma of charging high tariffs to very poor populations in rural settings
• Increased risk of non-payment from end users and social acceptance might be lower

**Difficulties with option 2:**
• Reducing risks over many parameters across the mini-grid project value chain (see next slides)
## Risk Mitigation for Mini-Grids (2/2)

<table>
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<tr>
<th>Project phase</th>
<th>Key risks</th>
<th>Innovations to mitigate risks</th>
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<tbody>
<tr>
<td>1. Site selection</td>
<td>Payment risks</td>
<td>GIS Mapping, AI village mapping, modular or easily redeployed mini-</td>
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<td>Political risks</td>
<td>grids, appliance audits</td>
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<td></td>
<td>Social acceptance risk</td>
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<td></td>
<td>Demand risk</td>
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<td></td>
<td>Environmental/force majeure risks</td>
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<td>2. Technical design</td>
<td>Resource price variability risk</td>
<td>Battery innovations (e.g. lithium-ion), standardised designs, increased</td>
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<td>Construction competition risk</td>
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<td></td>
<td>Technology risk</td>
<td>PV module efficiency</td>
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<td>3. O&amp;M</td>
<td>Operational risks</td>
<td>Remote monitoring and control systems, smart meters, diversification of incomes and offerings (e.g internet, appliances)</td>
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<td></td>
<td>Payment risks</td>
<td></td>
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<tr>
<td>4. Revenue &amp; Financing</td>
<td>Payment risks</td>
<td>Digital payments, smart meters, blockchain</td>
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<td></td>
<td>Social acceptance risk</td>
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<tr>
<td>5. Billing and Metering</td>
<td>Payment risks</td>
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Typical Design Process for Mini-Grids

1. Village Survey
2. Load Analysis
3. Energy Mapping
4. Village Mapping
5. Design (Grid, inverter, battery size, distribution network)
6. Installation

Source: ARE & Mlinda Foundation, 2019
<table>
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<tr>
<th>Ownership</th>
<th>Revenue model for private sector company</th>
<th>Example from South-East Asia</th>
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<tbody>
<tr>
<td>Private operator</td>
<td>Micro-utility (USD per kWh)</td>
<td>Mlinda, Rahimafrooz</td>
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<td>Service packages (price for services)</td>
<td>Okra Solar</td>
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<td>Public (utility)</td>
<td>Power purchase agreement (USD per kWh)</td>
<td>Clean Power Indonesia</td>
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<tr>
<td>Community</td>
<td>Power purchase agreement (USD per kWh)</td>
<td>Blue Solar</td>
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<tr>
<td>Hybrid (e.g. Special purpose vehicle)</td>
<td>Micro-utility (USD per kWh)</td>
<td>Gham Power</td>
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<td>Service packages (price for services)</td>
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ARE-OFID: Call for Proposals for hybrid mini-grids

- **USD 990,000** for launching a **Call for Proposals** funding in the form of grants for installation of hybrid mini-grids.

- **Three success stories** from **Bangladesh**, **India** and **Mali**.

- The projects brought great **improvements in the quality of life** of people.
- The possibility of using clean power **productively** is **bringing local economic development**.

Blendio, Mali  
Muradpur Island, Bangladesh  
Naratoli - Jharkhand, India
**Project Description:** Implementation of solar-powered hybrid mini-grid in Muradpur Island, Bangladesh as part of ARE-OFID grant cooperation agreement.

**Project Results:**
- 100 households connected (24/7 provision of electricity), 45 productive uses connected
- 1 health clinic, 3 primary and 1 secondary school connected

**Revenue model:** micro-utility (privately owned and operated)

**Innovations:** smart card payment (pre-payment) from vending kiosks
**Project Description**: Installation of three new hybrid mini-grids in three rural villages in India (Narotoli, Sahitoli, Pasanga) as part of ARE-OFID grant cooperation agreement.

**Project Results:**

- 358 households (24/7 provision of electricity), 61 commercial outlets (poultry units), 57 productive users connected
- 65 direct and indirect jobs created within local communities
- Income increase of 10.6% in the project villages, as a result of electricity connection

**Revenue model**: micro-utility (privately owned and operated)

**Innovations**: O&M clustering, loans to farmers, productive uses
ARE Case Study (3/3): Clean Power Indonesia & Ankur Scientific (Indonesia)

**Project Description:** Bamboo-powered biomass mini-grids for remote communities Mentawai Island in Indonesia.

**Project Results:**
- 1,250 households (24/7 provision of electricity)
- Productive uses such as sago processing facility, agroforestry products and tourism are powered
- 450 jobs created

**Revenue model:** 20-year PPA with national utility (PLN)

**Innovations:** clean biogas source, ubiquitous and fast-growing biomass feedstock
# ARE Key Recommendations (from EAIF 2019)

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<th>Challenges</th>
<th>Recommendations</th>
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<td>Lack of off-grid market information, data and transparency</td>
<td>- Aggregation of data from mini-grids -&gt; benchmark for the sector</td>
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<td>- Industry initiative(s) analyse financing models for the productive use of energy</td>
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<td>Unsupported or non-existing policy frameworks</td>
<td>- Regulation toolkit 2.0</td>
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<td>- Trainings for policy makers on mini-grids tariffs</td>
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<td>Lack of interaction between market players inside &amp; outside of local markets</td>
<td>- Support local and international developers in setting up partnerships (via local help desks)</td>
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<td>Lack of debt finance (both in terms of volume and design)</td>
<td>- Develop schemes that reward strong results and track records (RBF, climate finance)</td>
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<td>Lack of capacity among market players (local associations, project developers and entrepreneurs)</td>
<td>- facilitate the exchange of knowledge and experience (via twinning programmes between international and local business associations)</td>
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<td>- Youth and women entrepreneurship programmes</td>
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<td>- Training programmes for developers and entrepreneurs</td>
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Next ARE Activities

• **ECOWAS Sustainable Energy Forum** (Accra, 22-24 October 2019)

• **ARE Micro-Grid Workshop & Exhibition** (Bangalore, 27-29 November 2019)

• **6th ARE Energy Access Investment Forum** (Lusaka, 18-19 March 2020)
Looking forward to see you again you at:
ECOWAS Sustainable Energy Forum
Accra 22-24 October 2019

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