FINANCING ECONOMICALLY VIABLE DECENTRALIZED RENEWABLE ENERGY: BIOMASS GASIFIERS AND MICRO/MINI HYDROPOWER IN MYANMAR

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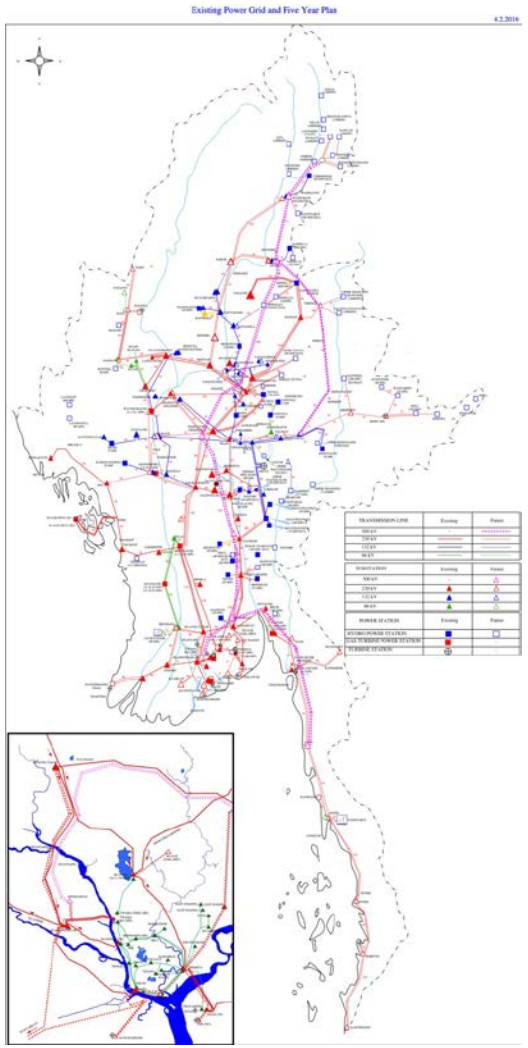
Overview

- Myanmar rural energy: policy snapshot
- Why biomass gasifiers and micro/mini hydro?
- Myanmar's biomass gasifiers context
- Myanmars' micro/mini hydro context
- Examples of immediate financing need

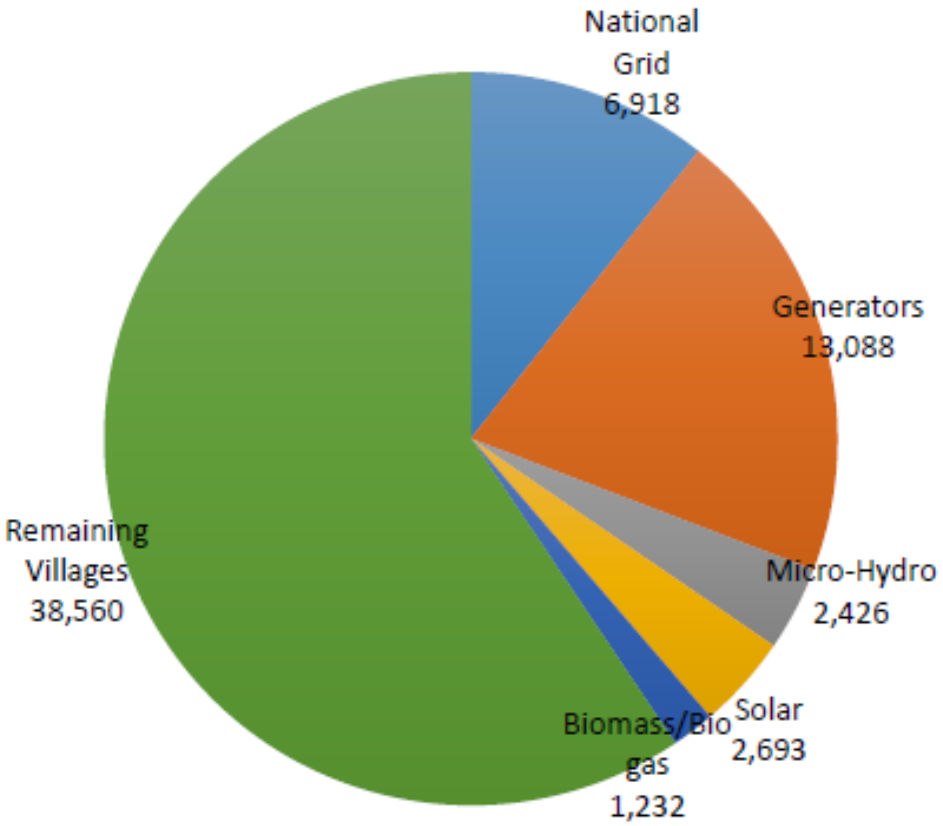
Universal Electrification in Myanmar

Policy Context

- National Electrification Plan (NEP)
  - 30% to 100% by 2030
  - $400M World Bank IDA loan
- Gap to address: Mini-Grid Integration
  - "Least Cost" analysis overlooked RE mini-grids, yet 6000+ RE mini-grids exist.
  - Rural electrification policy development
    - Top-down 'Business as Usual'
      - Subsidized solar home lighting systems
      - Clean coal and massive large hydropower
    - International influence: ADB, JICA, World Bank
    - Not building onto local solutions



Decentralized RE Solutions in Myanmar ~30-years of Experience



Source: Department of Rural Development 2015; World Bank NEP PAD 2015; Consultant Analysis

- Micro/Mini Hydropower
  - 6000+ units below 1MW for village electrification
- Biomass Gasifiers
  - 10,000+ units powering small-scale rice mills
  - 500+ units for village electrification

Source: State-wise Statistical Data Collection, Pyi Pyi Thant, Mekong Ecology and Energy Net (MEE Net), July 2017.
Source: Interview, Soe Tint Aung, Royal Htoo Linn Manufacturing, Co, Ltd. August 2017.
Source: Feasbility Study on Rice Husk Power Generation, Mitsubishi Research Institute, 2014.

Myanmar's Unique Progress
Lessons for Int'l Development Practitioners

- International development programs **aim to design** programs that can **scale, self-replicate, and sustain.**
- How did **Myanmar's 6000+ mini-grids** (biomass gassifiers and micro/mini hydro) happen?
  - No technology training
  - No international funding
  - No scaled government program or policy
  - **Yet, more mini-grids than any funded program!**
- Opportunity for development partners to ***learn from Myanmar*** how **locally-driven RE mini-grids** can be **scaled and sustainable.**

Source of Myanmar's Mini-Grid Success

Mini-Grid Social Entrepreneurs

- 20 – 30 years experience
- 6000+ mini-grids
- Self-Financed, Community-Owned
- Self-Engineered Technology
- Productive End Use built-in

A Closer Look at Existing Mini-Grids

Biomass Gasifiers and Micro/Mini Hydro

Why Biomass Gasifiers and Mini Hydro Technology Comparison

	Biomass Gassifiers	Solar PV	Micro/Mini Hydro
Investment USD/kW			
Pure O/M			
LCOE, US cent/kWh			
Resource Assessment			
Local Manufacturing			
Cost Drivers			
Pros / Cons			

Source: Skat Resource Centre for Development and Consultancies (Skat), May 2017
https://energypedia.info/images/a/ad/Mini-grid_Technology_Comparison.pdf

Biomass Gasifiers
Leading Gasifier Manufacturer

- 4 designs by Royal Htoo Linn Manufacturing Co., Ltd. (RHL)
  - Up to 2MW in series of units
- Productive End Use installed
  - Village electrification, 145 units
  - Rice Mill, 358 units
  - Irrigation Pumping, 45 units
  - Ice Mills, 69 units
  - Oil and Saw Mills, 116 units
- *Clean and Efficient Gasifiers*
  - No-liquid discharge, Tar/Ash re-used, Less Water, Cost savings
  - Testing completed: Department of Research and Innovation

Sittwe,Rakhine State

- **1350kW, Biomass-Diesel Hybrid**
- **24-hours electricity for entire state capital**
- **Distributions lines leased from MoEP**
- **Ran 2010-2015, until national grid arrived**
- **Other projects, 500kW – 1150kW each**

Biomass Gasifiers
Critical to Small-Scale Rice Production

- Small-Scale Rice Mills
  - 15,000 rice mills in Myanmar
    - 80-90% powered by biomass gasifiers: ~10,000 biomass gasifiers
      - Gasifiers → Kyat 25/unit
      - National grid → Kyat 170/unit
      - Diesel → Kyat 200 – 400 /unit
  - Rice farmers: Most with less than 5-acres

- Issue/Opportunity: Upgrade to Clean and Efficient Gasifiers
  - Awareness-building
    - Local manufactures and rice mill owners
    - Government and international development partners
  - Access to Financing!

Powering Communities and Small Industry

Micro and Mini Hydropower (<1MW)

- 5000+ projects, mostly Shan State
  - Many yet to be identified
- Quality Local Fabrication
  - Francis, Pelton, Turgo turbines
  - Penstock and Transformers
- Ownership Models
  - Based on community's strengths
  - Community, Cooperative, or Developer owned projects
  - Cooperative of *Local Industry*
- Vision
  - Provide low-cost, reliable electricity
  - Tap all micro/mini hydro potential
  - Contribute to the NEP

Case Study: 300kW Mini Hydro

- Financing Need: Upgrade from 80kW to 300kW
  - Increase from 500 to 1500 household users
  - Increase productive end use by 100kW
- Financing required
  - $150,000 for upgrade of mini hydro system
  - $50,000 for establishing productive end use
  - Required tenure: 5-years
  - 10% interest affordable
  - Collateral: very difficult
- Solution: Convince local bank to understand the revenue generation of the 80kW system.

Existing system of 80kW
Productive End Uses

External Enterprises	Villager Enterprises	Social Services	Household Use
Coffee plantations, 2	Brick making	Health clinics, 2	Carpentry tool, 1
Fuel pump, 1	Cash crop farming	Monasteries, 10	Corn thrasher, 1
Poultry farm, 1	Daily goods shops	Public centres	Electric rice cookers, ~250
Rice mill, 1	Damson fruit processing	Schools, 8	Electric frying pans, ~200
Telecom tower, 2	Fabrication shop	Streetlights	Fan, many
	Lime baking		Grinders, several
	Scaled lettuce crop		Mobile phone charging, many
	Silkworm breeding		Rice mills, several
	Tailoring		Refrigerators, several
	Truck rental		Televisions, many
	Vehicle repair shop		Water heaters, several
	Wood working		Washing machines, several
			Water pumps, many

Ownership and Financing
Hybrid: Developer + Cooperative

- Project initiation
  - Village community leaders contacted the developer
  - Developer facilitated the formation of a cooperative
  - Initial project was 30kW and then upgraded to 80kW
- Total Project Cost of 80kW: $441,000
  - 100 shares
    - 50% are owned by the developer
    - Rest are owned by the registered Cooperative
  - Cooperative is made up by villagers
- Monthly income and expenses
  - $2500 income
  - $900 operation and maintenance expenses

Immediate Financing Needs

- Project Financing
  - 1MW mini hydro project for 3000 households (23 villages plus a township)
  - Many micro and mini hydro projects in need of rehabilitation
  - 200kW biomass gasifier for hundreds of rice mills
- Capacity Building Needs
  - Evidence-based energy planning
  - Building awareness of local banks
  - Establishing productive end use in marginalized areas

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Thank you

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