
HPNET
HYDRO EMPOWERMENT NETWORK
ACCELERATING FINANCIALLY VIABLE
HYDRO MINI GRIDS
A CLOSER LOOK AT SMALL-SCALE HYDROPOWER IN S/SE ASIA
4th International Off-grid Renewable Energy Conference and Exhibit (IOREC)

Session Moderator

Dr. Binu Parthan, Sustainable Energy Associates

Presentors

Mr. Bir Bahadur Ghale, Hydro Energy Concern Pvt. Ltd.

Ms. Dipti Vaghela, Hydro Empowerment Network

Panelists

Mr. Bikash Pandey, Winrock International

Mr. Kapila Subasinghe, DFCC Bank Sri Lanka

Ms. Trimumpuni, IBEKA

Senator Adrian Banie Lasimbang, Tonibung

Ms. Rana Ghoneim, UNIDO

Mr. Gerhard Fischer, ASEAN Hydropower Competence Centre (HYCOM)

Case Profile

Nepal’s Barpak Micro Hydro Project

Bir Bahadur Ghale, Project Developer/ Owner

1986
Dynamo water mill

1991
50 kW hydro plant

2004
130 kW hydro plant

2015
Earthquake

2018
Upgrade to 500kW

Barpak Micro Hydro Project

Overview

	1991 -2004	2004 - present
Generation Capacity	**50 kW**	**130 kW**
Design Flow & Head	100 l/s Flow, 96 m Head	90 l/s Flow, 193 m Head
Connections	564 households, plus enterprises	1186 households, plus enterprises
Transmission	6.4 km LT line, 1.8 km MT line	12 km LT line, 2.8 km MT line (11kV)
Project Cost	**USD 58,022**	**USD 158,000**
Government Subsidy	20% (USD 11,600)	48% (USD 74,000)
Loan	60% (USD 34,810 USD) from Agricultural Development Bank	40% from relatives
Equity	20% (USD 11,600)	12%

Barpak Micro Hydro Project

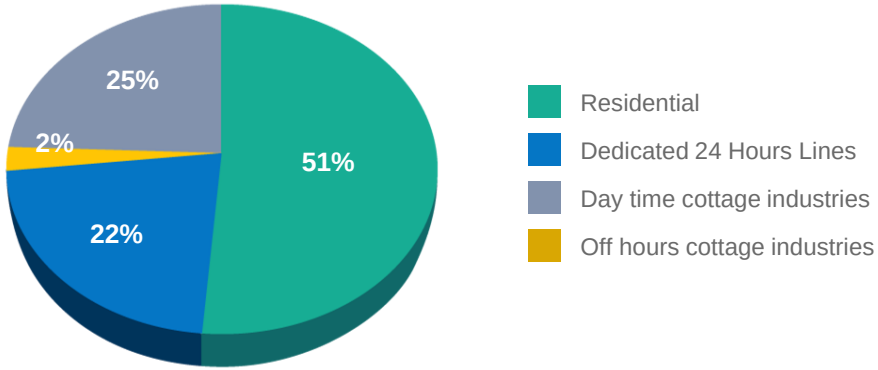
Productive End Use

Type of End Uses	Max. Load (kW)
Agro processing mills x5	20 kW
Oil Expeller mills x2	12 kW
High vision hall x1	1.2 kW
Cyber cafe x1	0.8 kW
Photo studio x1	0.8 kW
Metal workshop x2	12 kW
Stone Cutting Mill x3	
Bakery (Off hours) x1	12 kW
Mobile Tower x3	12-20 kW
Feed Mill x1	4.5 kW
Furniture Mil x2	13 kW
Cable TV x1	1.2 kW
Electronic Repairing Center x3	1.2 kW

Total Load = 105.7kW

Barpak Micro Hydro Project

Financial Viability



Tariff Structure

Consumer	Service	Flat Rate for Min. 25 Units	Per Unit Rate Above Minimum	Service
Residential	1 phase, up to 5A	USD 1.50	USD 0.07	24 hours
Dedicated 24 Hours Lines	3 phase, up to 25 kVA		USD 0.10 - 0.12	24 hours
Day time cottage industries	3 phase, up to 10 kW	USD 30	USD 0.08 - 0.10	7AM - 6AM
Off hours cottage industries	3 phase, up to 20 kW	USD 10	USD 0.03	11 PM - 5AM

Factors for Success

- Ownership structure: private - with clear incentive to promote productive end-uses and maximize energy sales.
- Technically competent owner/ operator
- Awareness raising and financing to increase productive end use; MHP is used much more than for lighting.
- Fair and transparent tariff setting, using a *time-of-use* structure.
- Capacity meets the demand

Case Profile

Myanmar's Mae Muk Waterfall Micro Hydro Project

Dipti Vaghela on behalf of U Sai Htun Hla, Project Co-developer/ Co-owner

2013
30kW hydro plant

2015
80 kW hydro plant

2018
Upgrade to 300kW

Generation capacity	**80kW to be upgraded to 300kW**
Design Flow and Head	100 l/s dry season, 200 l/s wet season; 183 meters
Connections	600 households, plus enterprises and social services
Transmission	32 km MT line (11kV), plus 32 km LT line, covering 11 villages
Project Cost	**USD 380,000** (as per current exchange rate)
Government Subsidy	None
Loan	None
Equity	60% from shareholders, 40% from connection fees

Mae Muk Waterfall Micro Hydro Project

Productive End Use

External Enterprises

- Coffee plantations, 2
- Fuel pump, 1
- Poultry farm, 1
- Rice mill, 1
- Telecom tower, 2

Villager Enterprises

- Brick making
- Cash crop farming
- Daily goods shops
- Damson fruit processing
- Fabrication shop
- Lime baking
- Scaled lettuce crop
- Silkworm breeding
- Tailoring
- Truck rental
- Vehicle repair shop
- Wood working

Social Services

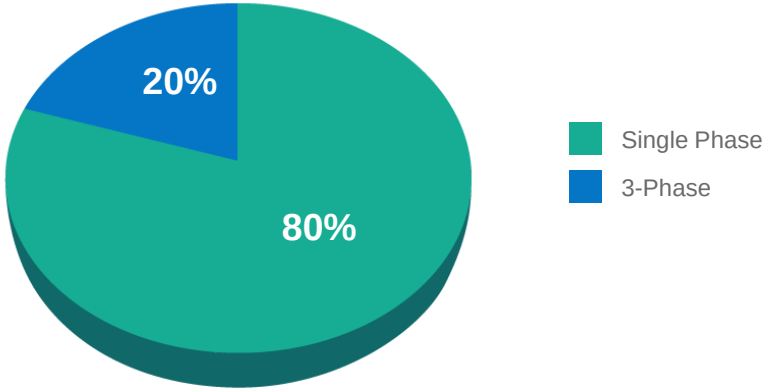
- Health clinics, 2
- Monasteries, 10
- Public centres
- Schools, 8
- Streetlights

Household Use

- Carpentry tool, 1
- Corn thrasher, 1
- Electric rice cookers, ~250
- Electric frying pans, ~200
- Fans, many
- Grinders, several
- Mobile phone charging, many
- Rice mills, several
- Refrigerators, several
- Televisions, many
- Water heaters, several
- Washing machines, several
- Water pumps, many

Mae Muk Waterfall Micro Hydro Project

Financial Viability

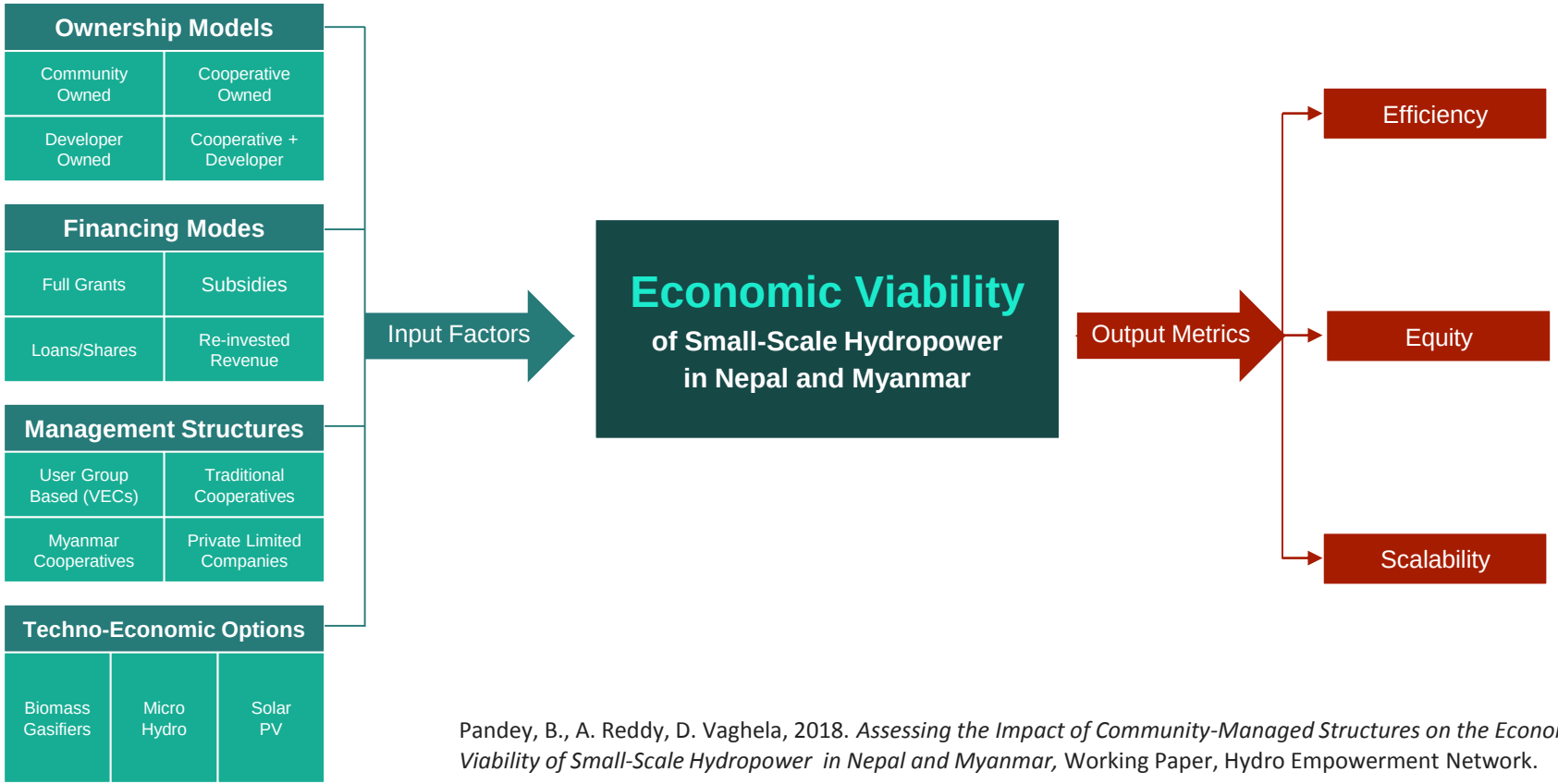


Tariff Structure (as per current exchange rates)

Services (24 hours)	Residential	Village Enterprises	Shareholders (Cooperative Members)	Dedicated Lines (External Enterprises)
Single Phase	USD 0.16	USD 0.16	USD 0.08	USD 0.16
3-Phase	USD 0.25	USD 0.25	USD 0.13	USD 0.16

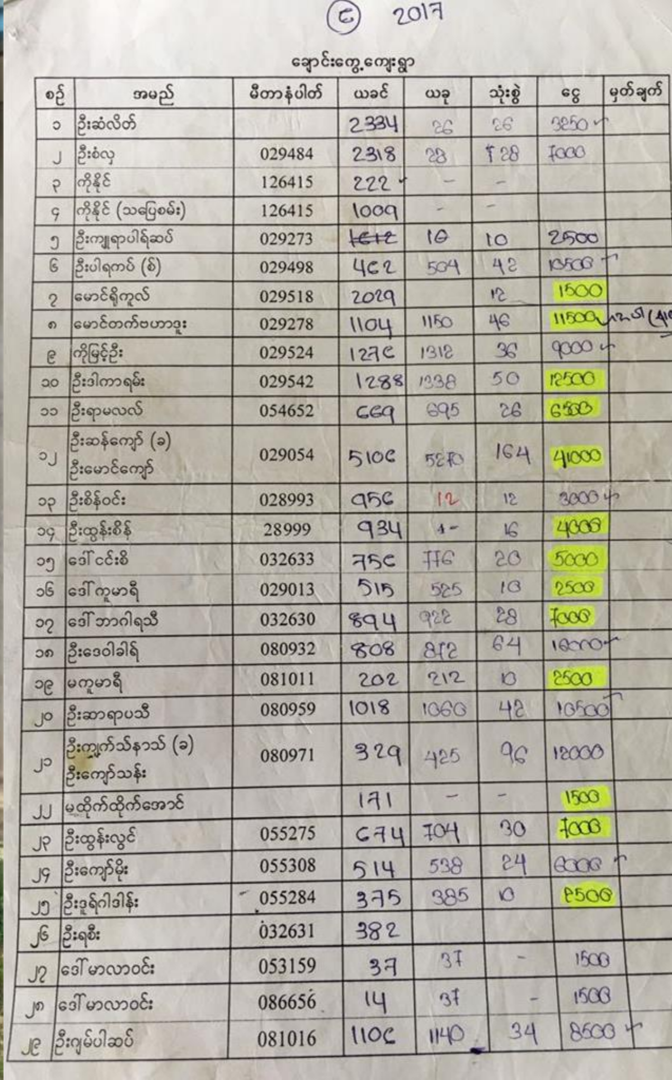
Viable Renewable Energy Mini-Grids

Factors for Efficiency, Equity, and Scalability



Pandey, B., A. Reddy, D. Vaghela, 2018. *Assessing the Impact of Community-Managed Structures on the Economic Viability of Small-Scale Hydropower in Nepal and Myanmar,* Working Paper, Hydro Empowerment Network.

Lin Yuang Chi Micro Hydro Cooperative-Owned Utility in Myanmar
Photo Credit: D. Vaghela



(၆) 2017

ချောင်းတွေ့ကျေးရွာ

စဉ်	အမည်	မီတာနံပါတ်	ယခင်	ယခု	သုံးစွဲ	ငွေ	မှတ်ချက်
၁	ဦးဆံလိတ်		2334	26	26	3250	
၂	ဦးစံလှ	029484	2318	28	28	7000	
၃	ကိုနိုင်	126415	222	-	-		
၄	ကိုနိုင် (သပြေစမ်း)	126415	1009	-	-		
၅	ဦးကျူရာပါရ်ဆပ်	029273		16	10	2500	
၆	ဦးပါရကပ် (စ်)	029498	462	504	42	10500	
၇	မောင်ရှိကူလ်	029518	2029		12	1500	
၈	မောင်တက်ဗဟာဒူး	029278	1104	1150	46	11500	၁၂ ပါ (
၉	ကိုမြင့်ဦး	029524	1276	1312	36	9000	
၁၀	ဦးဒါကာရမ်း	029542	1288	1338	50	12500	
၁၁	ဦးရာမလလ်	054652	669	695	26	6500	
၁၂	ဦးဆန်ကျော် (ခ) ဦးမောင်ကျော်	029054	5106	5270	164	41000	
၁၃	ဦးစိန်ဝင်း	028993	956	12	12	3000	
၁၄	ဦးထွန်းစိန်	28999	934	1-	16	4000	
၁၅	ဒေါ်ငင်းစိ	032633	756	776	20	5000	
၁၆	ဒေါ်ကူမာရီ	029013	515	525	10	2500	
၁၇	ဒေါ်ဘာဂါရသိ	032630	894	922	28	7000	
၁၈	ဦးဒေဝါခါရ်	080932	808	842	64	16000	
၁၉	မကူမာရီ	081011	202	212	10	2500	
၂၀	ဦးဆာရာပသိ	080959	1018	1060	42	10500	
၂၁	ဦးကျက်သ်နာသ် (ခ) ဦးကျော်သန်း	080971	329	425	96	12000	
၂၂	မထိုက်ထိုက်အောင်		171	-	-	1500	
၂၃	ဦးထွန်းလွင်	055275	674	704	30	7000	
၂၄	ဦးကျော်မိုး	055308	514	538	24	6000	
၂၅	ဦးဒူရ်ဂါဒါန်း	055284	375	385	10	2500	
၂၆	ဦးရစီး	032631	382				
၂၇	ဒေါ်မာလာဝင်း	053159	37	37	-	1500	
၂၈	ဒေါ်မာလာဝင်း	086656	14	37	-	1500	
၂၉	ဦးဂျမ်ပါဆပ်	081016	1106	1140	34	8500	

60 kW system, Pekalongan,
Central Java Indonesia
Photo Credit: Asosiasi Hidro Bandung

20kW system, Htan Hla Pin,
Southern Shan State, Myanmar
Photo Credit: Loïs Sevestre

Louis, master machinist at the Centre for Renewable Energy Appropriate Technology (CREATE), Malaysia

Photo Credit: D.Vaghela

HPNET S/SE Asia Regional *Training of Trainers for Electronic Load Controllers,* supported by Wisions SEPS, at ASEAN Hydropower Competance Centre (HYCOM)
Photo Credit: D. Vaghela

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