

Pico Hydro Project Presentation

MASCHINEN & TECHNIK, INC.

Since 1979



COUNTRYSIDE SITUATION



Future leaders study with kerosene lamp

KEROSENE STREETLAMP



Renewable Energy Sources and Technologies

Renewable Energy

- Refer to energy sources that can be obtained from continuously recurring energy processes and cycles in the natural environment including energy sources from waste materials and the technologies that utilize these energy sources.



Solar Energy



Biomass Energy



Wind Energy



Geothermal Energy

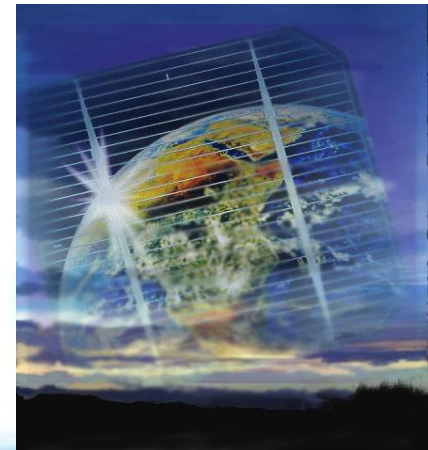


Hydropower

Renewable Energy Sources and Technologies

Why utilize renewable energy?

- Relatively environmentally benign
- Fosters national energy independence and security
- Enhances the fuel diversity



Energy Resource (Hydro)

TYPE ACCORDING TO SIZE

- Large (over 50MW)
- Small (10MW to 50MW)
- Mini (100kW to 10MW)
- Micro (under 100kW)
- Pico (under 10kW)

TYPE ACCORDING TO DEVELOPMENT

- Run-of-river
- Pondage (Dam)
- Pumped-Storage



Rural Electrification

Challenges to New and Renewable Energy Technologies

- Relatively new technologies
- Limited market
- High capital costs

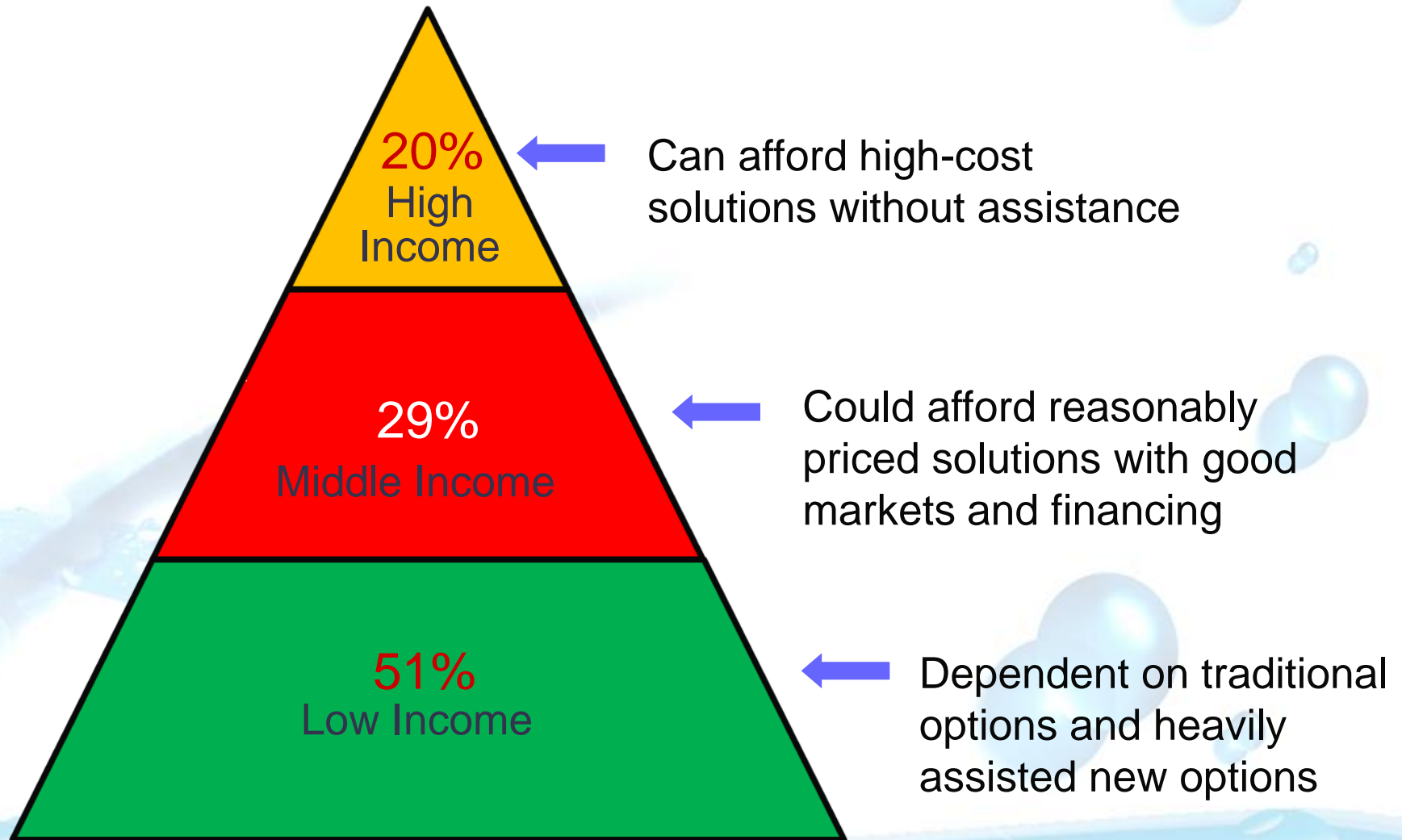


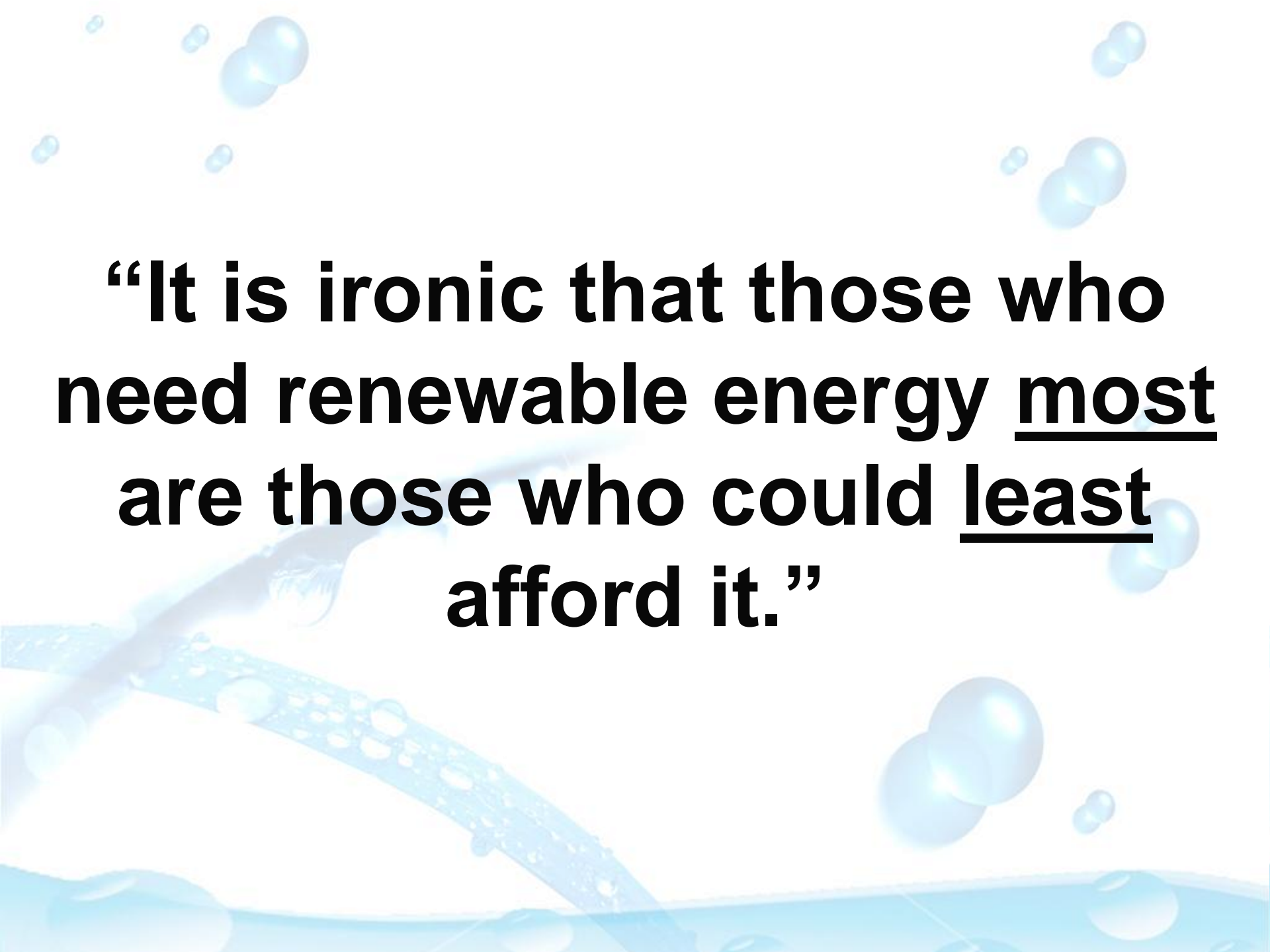
“AFFORDABILITY”

Barriers to Renewable Energy for Rural Electrification

- Limited information and expertise
- Limited awareness
- Lack of effective policies and programs to encourage investment in renewable energy
- Lack of appropriate financing mechanisms
- Lack of sustainable commercial delivery mechanisms
- Lack of maintenance services

Market Status (Rural Electrification)





“It is ironic that those who need renewable energy most are those who could least afford it.”

OPTIONS FOR RURAL ELECTRIFICATION

- Grid Extension
- Diesel Generators
- Solar PV
- Hydro (Micro and Pico)
- Wind
- Hybrids (Multiple-sources combined)

The Pico Hydro Advantage

- Relatively the cheapest source of electricity per kWh
- Requires lesser investment cost compared to micro hydro installations
- Faster to construct and install
- Easier to maintain and repair
- Can be locally manufactured

OBJECTIVES

1. To provide clean, affordable (low-cost) electricity to rural households/ communities;
2. To replace sooty kerosene lamps/candle with energy-efficient lamps; compact fluorescent lamp (CFL) or LED;
3. To contribute to sustainable development in beneficiary rural villages;
4. To reduce CO₂ emissions thru displacement of other fossil-fuel options for off-grid energy service;
5. To install about 4,400 pico-hydro systems with a total capacity of 2.7 MW in a period of 7 years;
6. To develop in-country manufacture of pico-hydro turbine in the medium term;
7. To develop and increase awareness in caring for and preserving the watershed to sustain the pico-hydro installation.

PICO-HYDRO TECHNOLOGY



EQUIPMENT

Low Head Application

3 models

- PHEG200W
- PHEG500W
- PHEG1000W

“low-head”
pico-hydro turbines

TYPE	PHEG-200W	PHEG-500W	PHEG-1000W
Rate Power	200W	500W	1000W
Water Head	1.5 m	1.5 m	1.5 m
Water Flow	35 liters/sec.	70 Liters/sec.	130 Liters/sec.
Net Weight	25 kg	45 kg	75 kg
Generator Output	.220 VAC, 60 HZ single-phase permanent-magnet alternator.		



EQUIPMENT

High Head Application

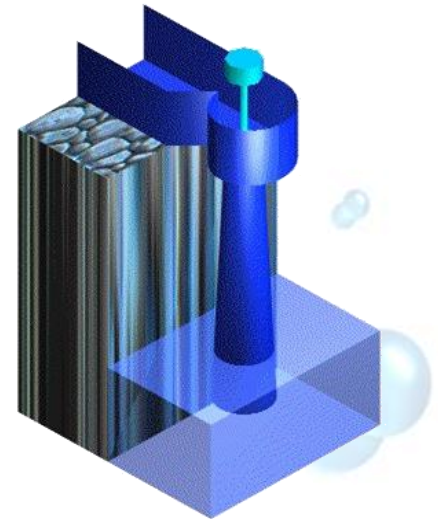
2 models

- PHEG200W
- PHEG500W
- Low water flow rate 6.3ltrs/
sec Head: 6-13mtrs
- Easy to install
- Environment friendly
- Inexpensive
- Portable



COMPONENTS

1. Turbine/generator – for electricity generation; propeller-type turbine, single-phase permanent magnet generator, 220 VAC, 60Hz.
2. Water channel – fabricated canal for easy assurance of adequate water flow, with gate block to stop water flow and screen to filter-out debris.
3. Draft tube – tapered tube for calculated water column/head to rotate turbine propeller; made of GI sheet.
4. Load controller – to control generator speed, voltage and frequency depending on connected load; can be manual or automatic.



SITE SELECTION

1. Water source (river, creek, irrigation canal) with flow of more than 35 LPS
2. Water vertical drop of 1.5 m
3. Site proximity to the use of the electric output



1. Water Fall



2. Dam



3. Side Channel

INSTALLATION

1. Build the diversion canal
2. Construct the support structure for the water channel and draft tube
3. Mount the turbine and generator
4. Install the distribution line and regulator
5. Connect the electrical loads

Maintenance

1. Clean the water canal to maintain the flow
2. Grease the two bearings of the turbine through the nipples
3. Clear the distribution lines from branches
4. Protect the water shed



Experiences

- Individual households
- Cluster of households
- Small village
- Remote field stations

Pico Hydro Installations (Luna, Apayao)



Pico Hydro Installations (Lagawe, Ifugao)



Pico Hydro Installations

(LISP Light Industry and Science Park-Cabuyao, Laguna)



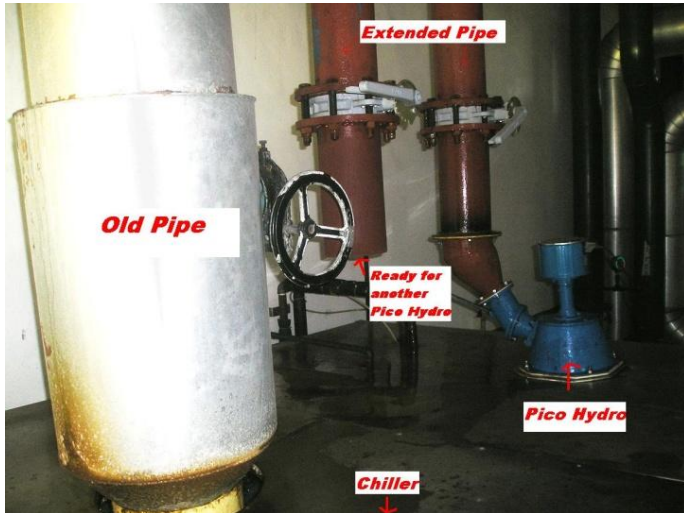
Pico Hydro Installation (Igputoy, Antique)



Pico Hydro Installations (La Trinidad, Benguet)



Pico Hydro Installation (Nestle-Lipa, Batangas)



BUSINESS OPPORTUNITIES

- A. Range
- B. Costs
- C. Cost recovery
- D. Potential Market/Applications

RANGE

PHEG 200 - 5 to 7 households

PHEG 500 - 13 to 18 households

PHEG 1000- 25 to 40 households

Line losses dependent on:

1. Distance of PHEG to distribution pole
2. Distance of houses from distribution pole

SYSTEM COSTS

1. Equipment-Low Head

a) Turbine/Generator with controller

200W - P20, 800

500W - P38, 040

1000W - P63, 920

b) Accessories

Water Channel - Optional according to requirements

Draft Tube - Optional according to requirements

2. Equipment –High Head

200W - no stock

500W - P40, 840

SYSTEM COSTS

3. Wiring

Royal Cord #12

Royal Cord #10

Royal Cord #8

4. Infrastructure (Civil)

Diversion canal

Support structure

5. Housewiring (~ P3, 000 to P5, 000)

including 2 CFL lamps, switches and outlet
(to be borne by each household)

COST RECOVERY

FUNDING

COST RECOVERY

1. Grant/Donation -
2. Subsidy -
3. Investment -

None

Partial or Full

Full

POTENTIAL MARKET/APPLICATIONS

1. Electric loads along irrigation canals
 2. Remote villages along rivers
 3. Remote stations in water shed areas
- Livelihood applications
 - Poultry lighting
 - Battery charging
 - Drying

SUSTAINABLE DEVELOPMENT BENEFITS

1. Clean, better-quality, convenient, reliable and affordable (low-cost) electricity;
2. Improved lighting for household/community work and school assignments;
3. Access to information, remote-education and entertainment thru TV and radio;
4. No more pollution from sooty kerosene lamps and candles which can cause respiratory illness;
5. Extended working hours for community and household activities (social, livelihood and entertainment);
6. Better security with brighter surroundings; no fire hazards from unattended kerosene, lamps and candles;

SUSTAINABLE DEVELOPMENT BENEFITS

7. Convenient charging for cell phones and lead storage batteries (for lighting of more distant households);
8. Reliable electric power for livelihood opportunities; cottage industry;
9. Increased environmental awareness in caring for and preserving the watershed;
10. Incentives from the Gold Standard for Voluntary Emission Reductions;
11. Improved gender equality as women will be trained on the maintenance of the units. In addition, they will be the beneficiaries of micro-credit schemes;
12. Creation of new employment opportunities for marketing, installation and maintenance of the units.

RECOMMENDATIONS

The high initial cost of equipment and installation is a significant deterrent to the extensive deployment of renewable energy to rural impoverished villages. It is necessary therefore to provide:

- Incentives to encourage investors in renewable energy
- Affordable financing thru micro-credit¹
- Project development assistance/subsidy
- Gold Standard Voluntary Emission Credits to contribute to more feasible RE projects for those who need them most.