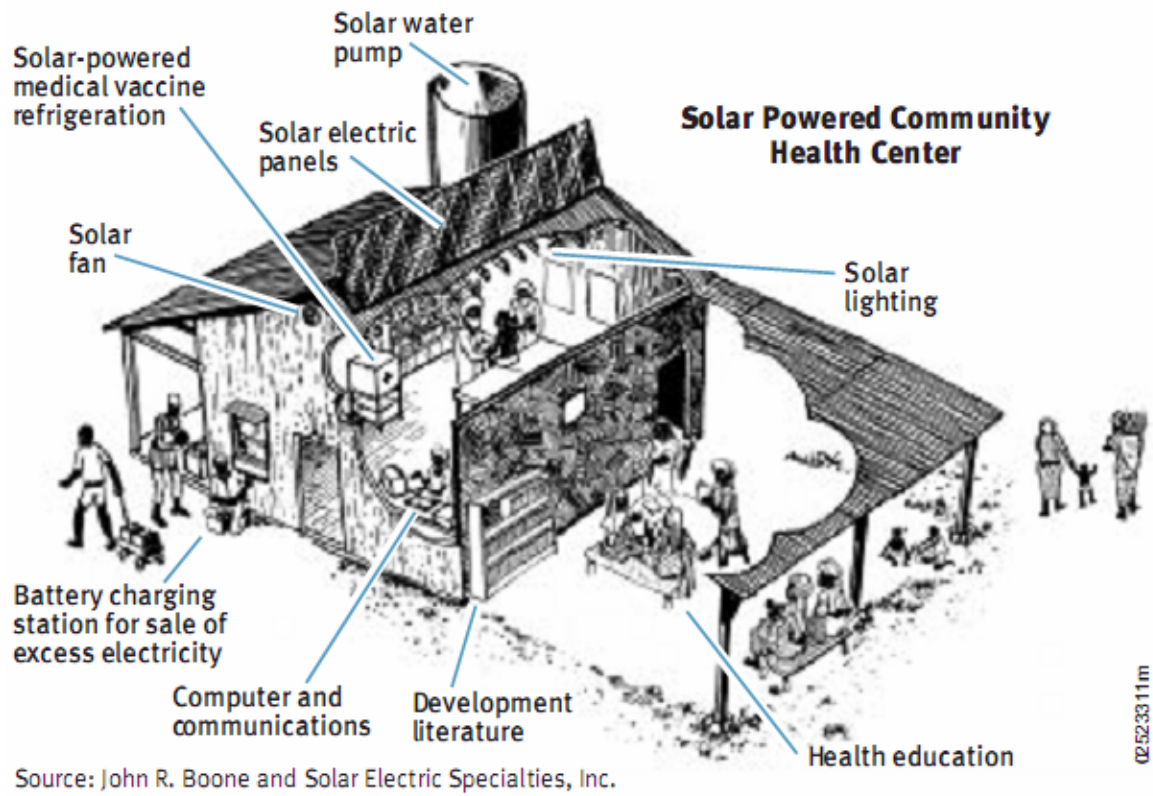
Electrification in isolated regions of Mexico

Renewable Energy for Rural Health Clinics

Tens of thousands of medical clinics in the lesser developed countries of the world do not have access to mains power. This lack of power is a serious obstacle to improving the health of villagers:

- Refrigeration for vaccine storage is only possible using gas or kerosene.
- Lighting for medical procedures, education etc. is only available using poor- quality and expensive torches, gas or kerosene lanterns.
- The use of radio, TV, VCR for communication, education and recreation is greatly restricted.
- Cooling fans are not available.
- UV water sterilisation is not possible.

Typical applications in a rural health clinic



	Power (Watts)	**On-time (hours/day)**	**Energy/day (watt-hours)**
Vaccine refrigerator	60	5-10	300-600
Vaccine refrigerator/freezer	60	6-12	410-720
Lights (each)	12	2-12	40-240
Communication VHF radio	30	1	30
Microscope	15	1	15
Centrifuge nebulizer	150	0.3-2	50-300
Vaporizer	40	1-4	40-160
Oxygen concentrator	300	1-4	300-1200
Overhead fan	40	4-12	160-480
Water pump (1500 liters/day from 40 meters)	100	6	600
TV			
12“ (B&W)	15	1-4	15-60
19“ (Color)	60	1-4	60-240
25“ (Color)	130	1-4	130-520
VCR	30	1-4	30-120
AM/FM stereo	15	1-12	15-180
Electric sterilizer	1500	0.5-2	750-3000

Health Clinic Applications

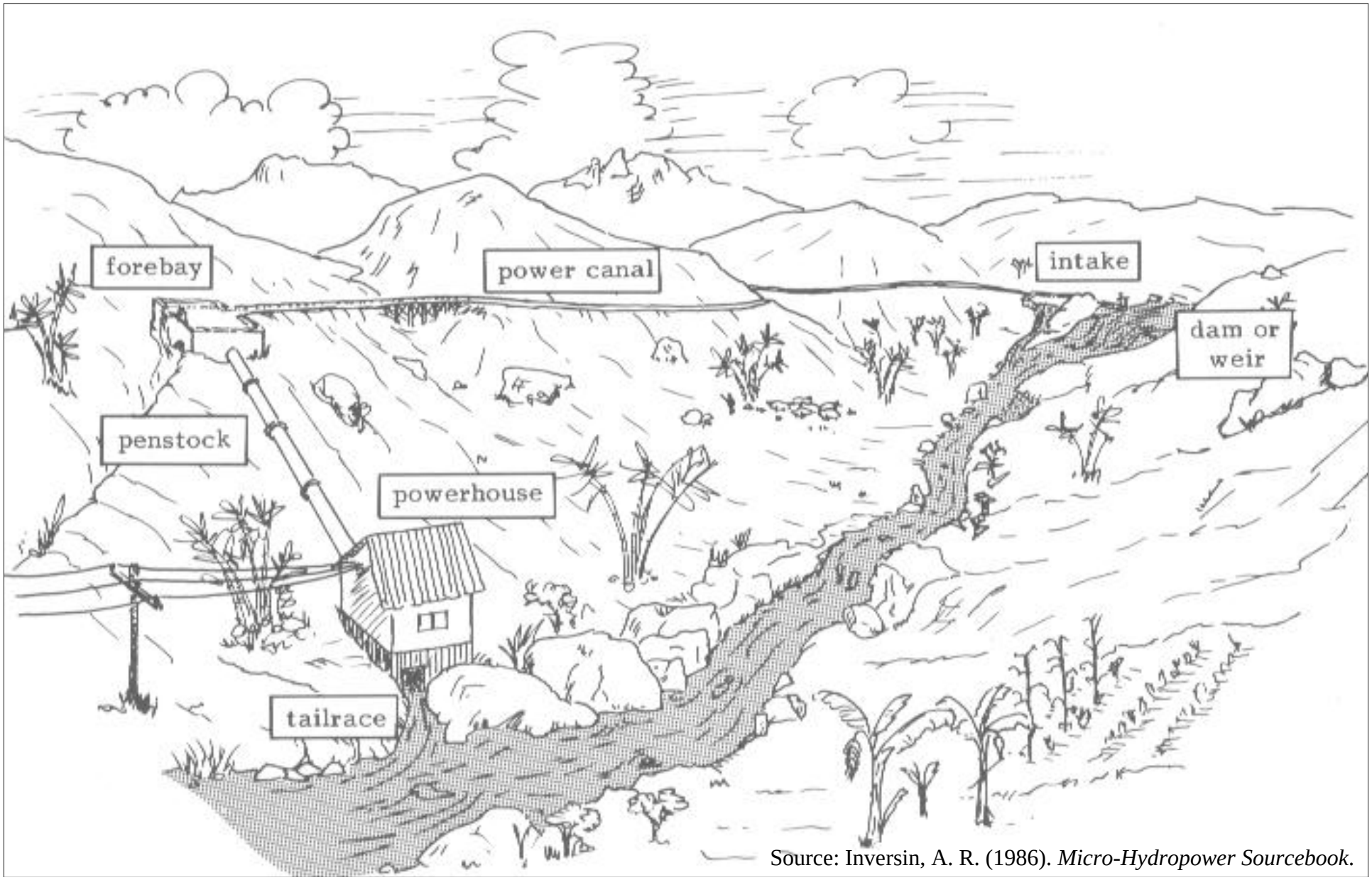
- Vaccine Refrigeration and Ice Pack Freezing
- Communications
- Medical Appliances
- Sterilization
- Water Treatment
- Water Supply
- Education
- Health Staff Amenities
- Income Generation

Jim Welch, Remote Power/PIX00800

SEI/PIX00468

Ken Olsen, SEI/PIX00491

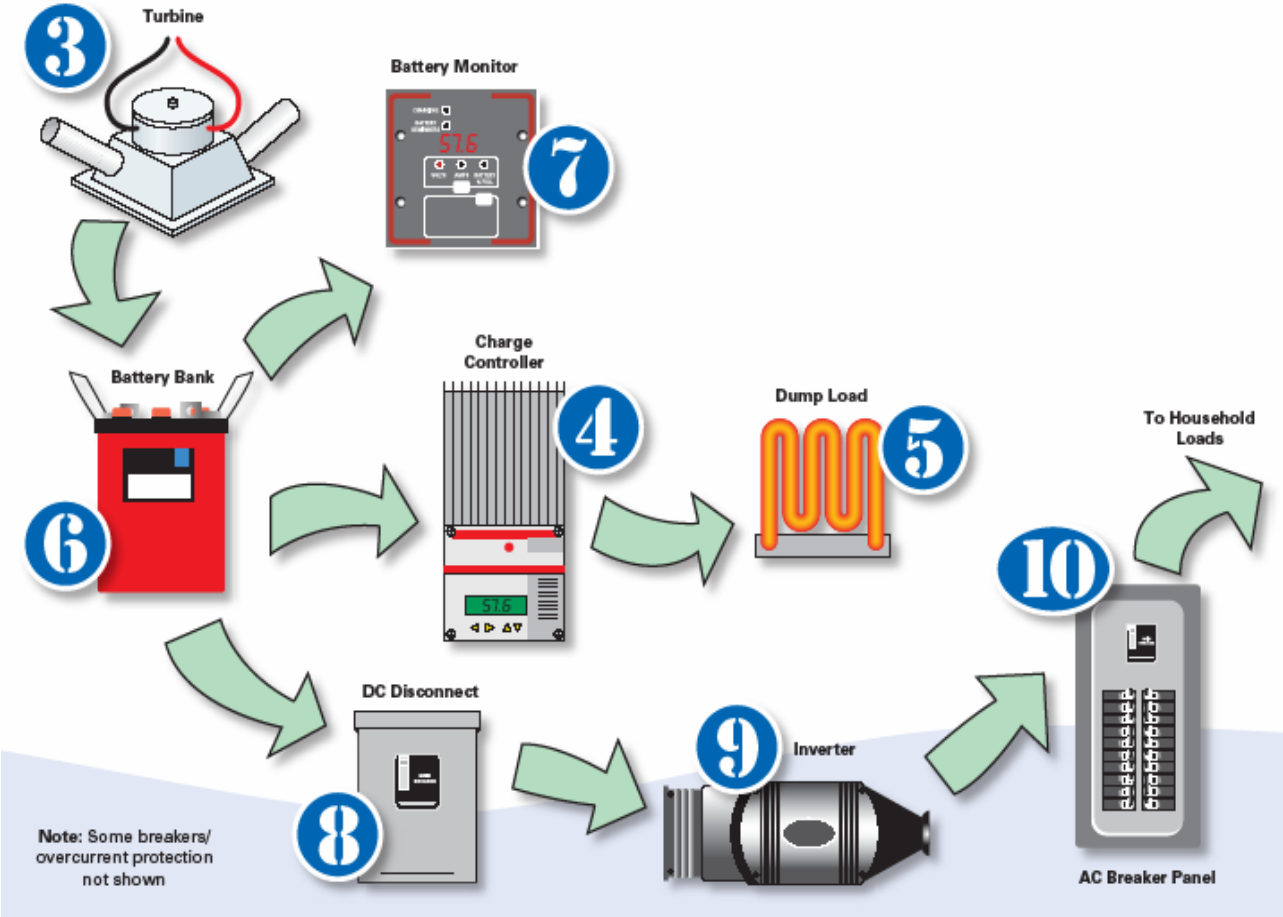
Micro-hydro technology

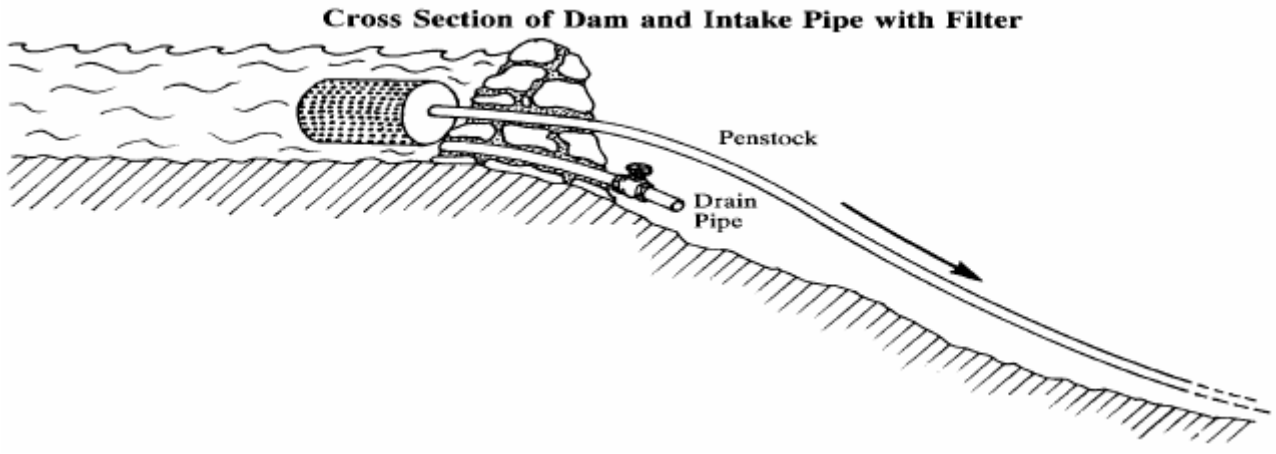


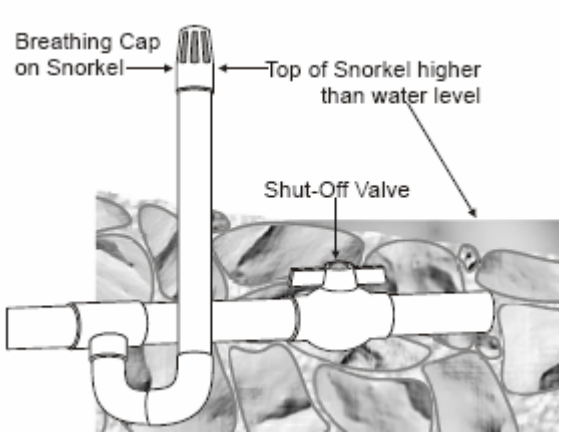
Source: Inversin, A. R. (1986). *Micro-Hydropower Sourcebook*.

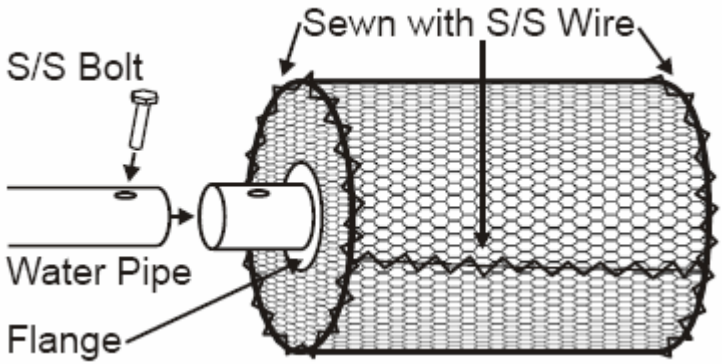
1 Intake

2 Pipeline

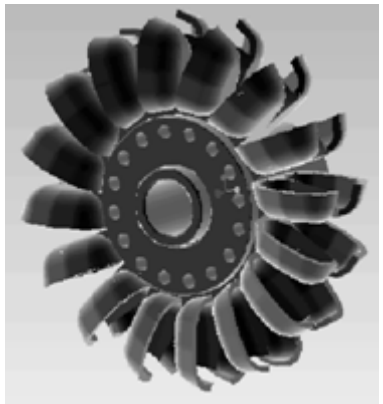
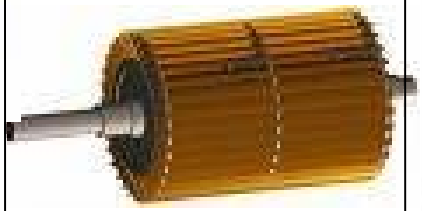
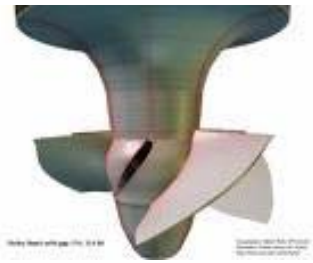


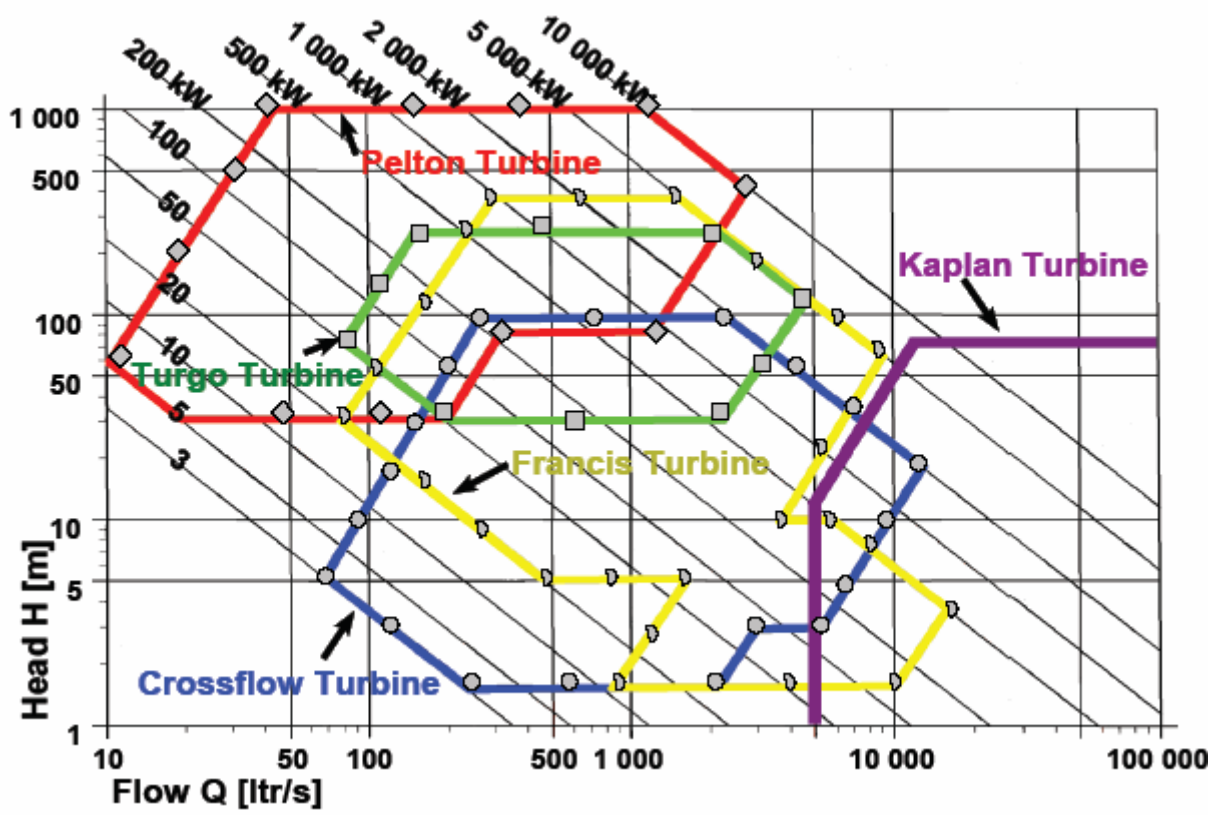

Cross Section of Dam and Intake Pipe with Filter
Penstock
Drain
Pipe


Breathing Cap
on Snorkel
Top of Snorkel higher
than water level
Shut-Off Valve


Sewn with S/S Wire
S/S Bolt
Water Pipe
Flange

Micro-hydro technology

Pelton	Turgo	Crossflow	Kaplan	Centrifugal pump
				


200 kW
500 kW
1 000 kW
2 000 kW
5 000 kW
10 000 kW
100
50
20
10
5
3
Pelton Turbine
Kaplan Turbine
Turgo Turbine
Francis Turbine
Crossflow Turbine
Head H [m]
1 000
500
100
50
10
5
1
Flow Q [ltr/s]
10
50
100
500
1 000
10 000
100 000

Experiments and tests made in the Centre for Alternative Technology in Wales (CAT)

Study Cases in S. Mexico

Study Cases in S. Mexico

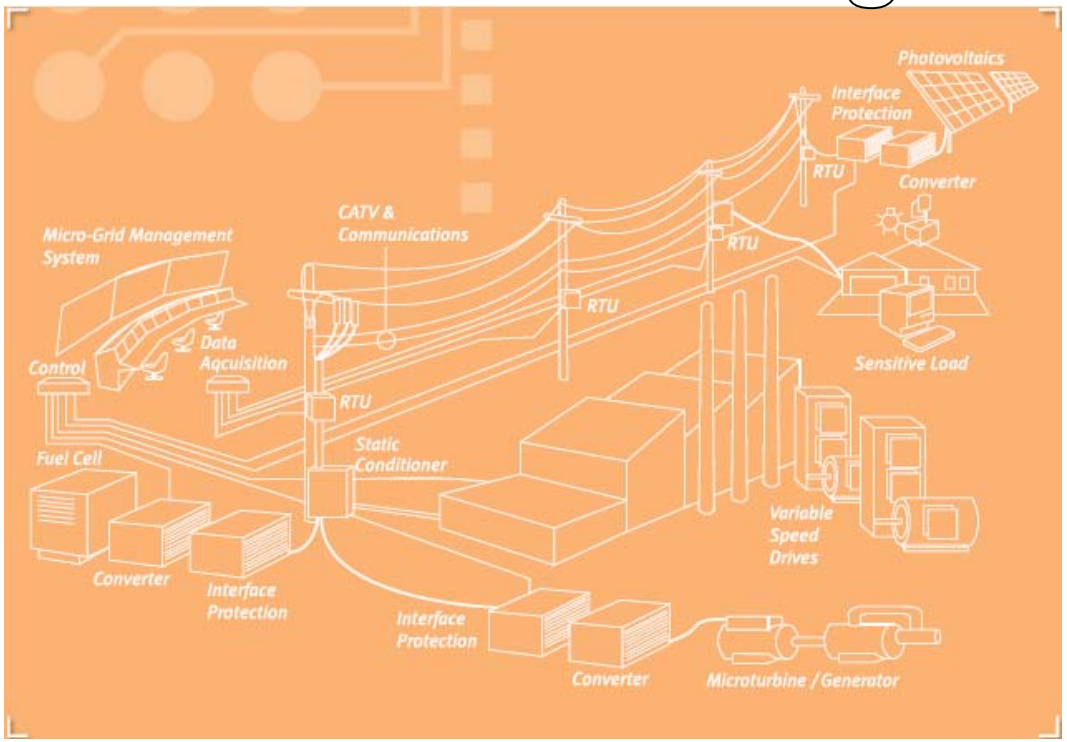
Power: 3 kW
Head: 35 meter
Flow: 20 liters/second

• Training procedures for local technicians
• Training on how to build, manage and repair the systems

And the next day…

Micro-hydro

Microgrid


Photovoltaics
Interface Protection
RTU
Converter
CATV & Communications
Micro-Grid Management System
RTU
RTU
Data Acquisition
Control
Sensitive Load
RTU
Static Conditioner
Fuel Cell
Variable Speed Drives
Converter
Interface Protection
Interface Protection
Converter
Microturbine / Generator

Conclusions:

• There are great potential benefits from cooperation with other human service sectors such as education, agriculture, safe water supply, economic development, and communications. These links are in need of development.
• Energy supply in the local community can generate income to support operating expenses.
• Lack of maintenance is common and leads to system failure.
• Users are often unaware of the proper operation, care, or limitations of systems. Metering is often not understood or is confusing to the user.
• Training must be thorough and ongoing.
• The energy system/application must be the least-cost, highest benefit option to meet the needs of public health care.
• Systems should be designed and provided as completely and detailed as possible.
• Adequate technical and user manuals must accompany systems and equipment.
• Program planners need reliable and understandable information regarding energy choices.
• Use of technology friendly to the environment (natural and social).
• Development of environmental values among the engineers.
• Satisfying social needs in groups of population who have been cut out from electricity.
• Taking active role in the discussion for environment, climate change and social justice in Europe .

Thank you for your attention..
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