

Effective Deployment of Small Wind Systems in Asian Rural Areas

Implementation guidelines and best practices:
optimal approach of PV-small-wind-hybrid-
systems in the rural context



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Optimal approach of PV-small-wind-hybrid-systems in the rural context

The wind turbine has many advantages that make it an attractive energy source, especially in parts of the world where the transmission infrastructure is not fully developed.

It is modular, can be combined with PV, biomass & small hydro to form hybrid systems; easy to install and match supply & demand.



The fuel – the free and plentiful wind

Environmental Impact Analysis

for small wind/hybrid systems only an *environmental scope is applicable* as follows:

- policy and legislation framework
- technical design, battery bank & fuel storage (diesel gen)
- impacts: mainly visual & noise and spill risks (diesel)
- mitigation measures to decrease the environmental impact

Environmental Impact Analysis

- analysis of alternatives for energy services
- monitoring in the construction and operation phase.
- social consultation and participation
- socio-economic effects
- Final product: draft environmental scoping report

wind power basics: the natural resource

Know the characteristics of climate and wind regime (“the fuel”).

The first task is the meteorological investigation for calculation of the project potential:

- existing long-term measurements of wind speed and direction from a meteorological station.
- quality assessment of such data
- identification, planning and execution of wind measurements
- maps containing height and land-use (roughness) contours.

wind power basics: end user needs & load demand

The main scope of the energy system is to supply energy services to the community.

The second task is to design the power system by describing the required individual and communitarian services, i.e. energy consumption; load profile (day, week), location; priority; seasons

The survey shall be done in close collaboration with the local community and authority.

The list should contain required AND desired services for immediate and future implementation.

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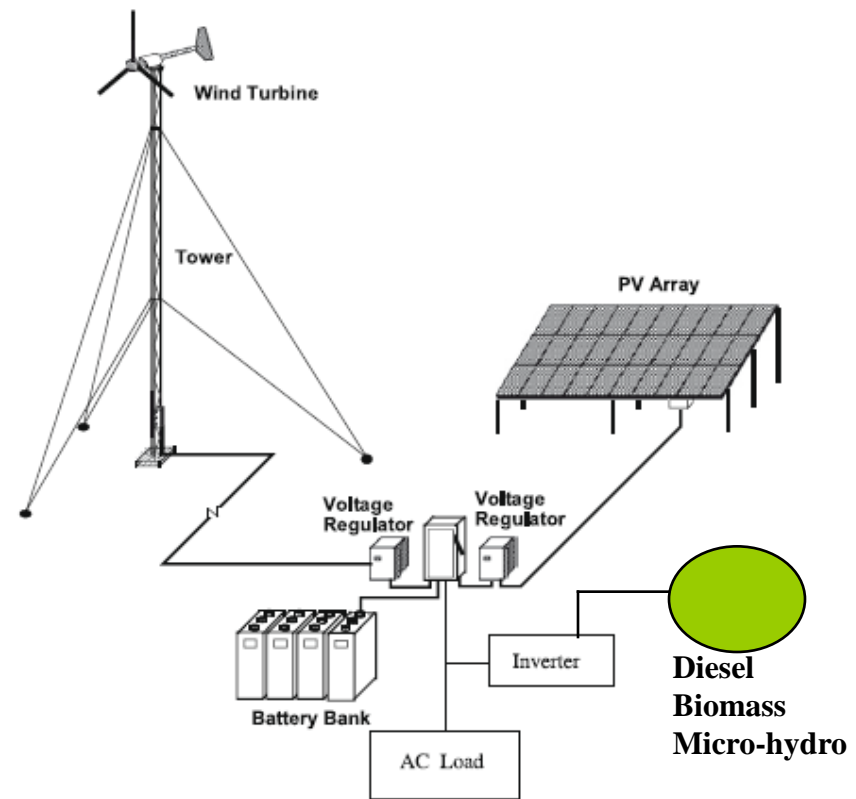
Ideal selection of the system size:

wind resource \sim load

Problem: this happens very seldom

Solution:

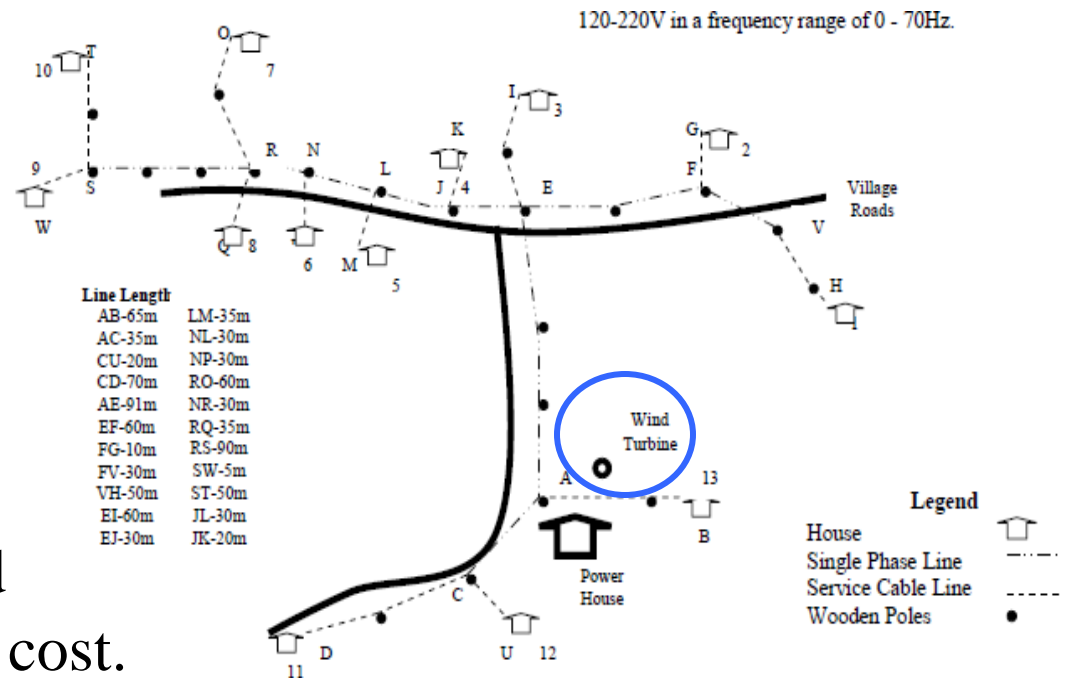
- creating own energy matrix by integrating other existing resources: **hybrids**
- energy storage engineering



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Performance in mini/village rural grids:

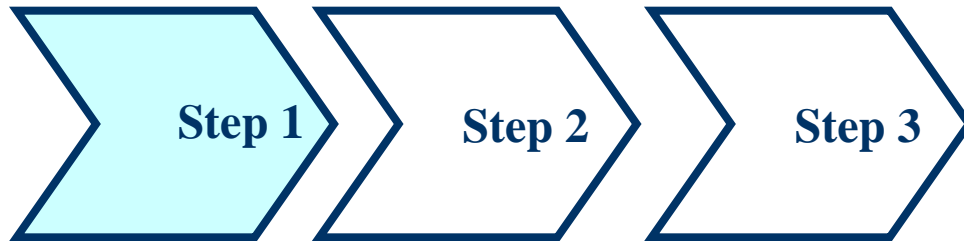
offers a great potential of small wind turbines or hybrid systems to show their competitiveness with conventional wind farms, thus challenging the small wind industry to meet its potential by producing reliable and robust machines at lower cost.



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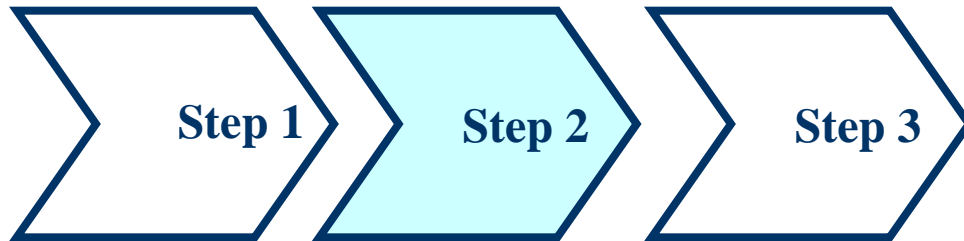
.... However, to make individual case studies replicable in large scale, we need to design a step by step concept

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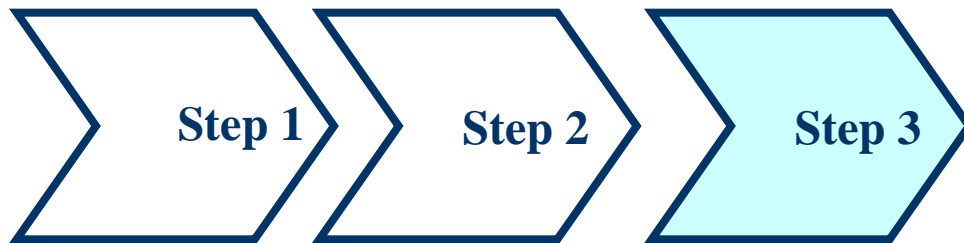
Identification of venture partners:

1. Team up with science and technology, R & D
2. Invite private sector to participate in the solution



Identification of techno-economic challenges:

1. Systems easy to erect and combine (“hybridizing”)
2. Equipment suitable for small wind velocities
3. Reliable energy storage systems



Identification of techno-economic solutions:

1. Easy power electronics (“easy-tronics”)
2. Design of auto-compensating permanent magnet motors and state of the art wind-propellers.
3. Alternative energy storage models like hydrogen, flying wheel and compressed air

Result: simple mass-scale replication

Thank you !

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