



MinVayu

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## Hybrid Systems for Minigrids

# Scaling Up Renewable Energy Minigrids for Rural Electrification

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Raipur, Chhattisgarh

Jorge Ayarza  
Minvayu



# MinVayu

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Part of the Auroville Foundation, Auroville, Tamil Nadu

Goal: To make hybrid systems available in rural areas

Why?

Do you have problems boosting/equalizing your battery?

Do you have problems in the monsoon season?

Do your clients use power at night?

Do you want longer battery life?

Do you want to know how the system is operating?

Do you want productive use of power – you may need more than 4 hrs per day for this!

PV is great, but it is better when you use a HYBRID



# MinVayu's solution

100 students to date  
Train, train, train



Improve a simple  
open-source turbine



Continuous Improvement  
lower cost/kw installed







# MinVayu

Training villagers/entrepreneurs how to build small wind turbines

Local manufacture = sustainability





# MinVayu's Turbines



Designed for Tropical Environment  
Made 100% locally  
Efficient design for low winds  
Custom designs for special applications

Battery Charging of any voltage  
(Typically 12 – 48V)

High voltage designs available

Wind-electric batteryless waterpumping using  
off the shelf 3-phase submersible pump

Custom Designed Blades for optimum site performance

Turbine sizes from 100W up to 2,500W





# Wind Turbine Specs

Diameter (m)	1.8	3	4.2
Nominal Watt at 10m/s	350	800	1,700
Cut-in rpm	240	167	120
Kwh at 4m/s	30	85	166
Kwh at 5m/s	52	146	286
Kwh at 6m/s	74	205	402
Rs/kWr	157	87	73



# Hybrid controller

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Auroville Designed Microprocessor-based smart controller for mini-grids

Solar/Wind/Hydro/Diesel Hybrid

Programmable/Open Source

Data Logging

Internet/Cell 2G/3G capable

Payment-capabilities possible (Lumiere)

Full autonomous operation

Flexible

Waterpumping applications available

Industry-standard add-on components





# Wattmon Smart Controller

Wattmon can be used in a variety of configurations.

Hybrid setup with wind/solar configuration

In this setup 2 current sensor modules are monitoring 4 channels of DC power up to 75A each, and a dual relay module is controlling 2 SSR devices which control load and dump load outputs.

All logging and control of the DC system happens autonomously and is stored on the microSD card.

Internet access allows monitoring and control of settings. Can also be set up with 2G cell phone configuration

Base price: 12,600 Rs





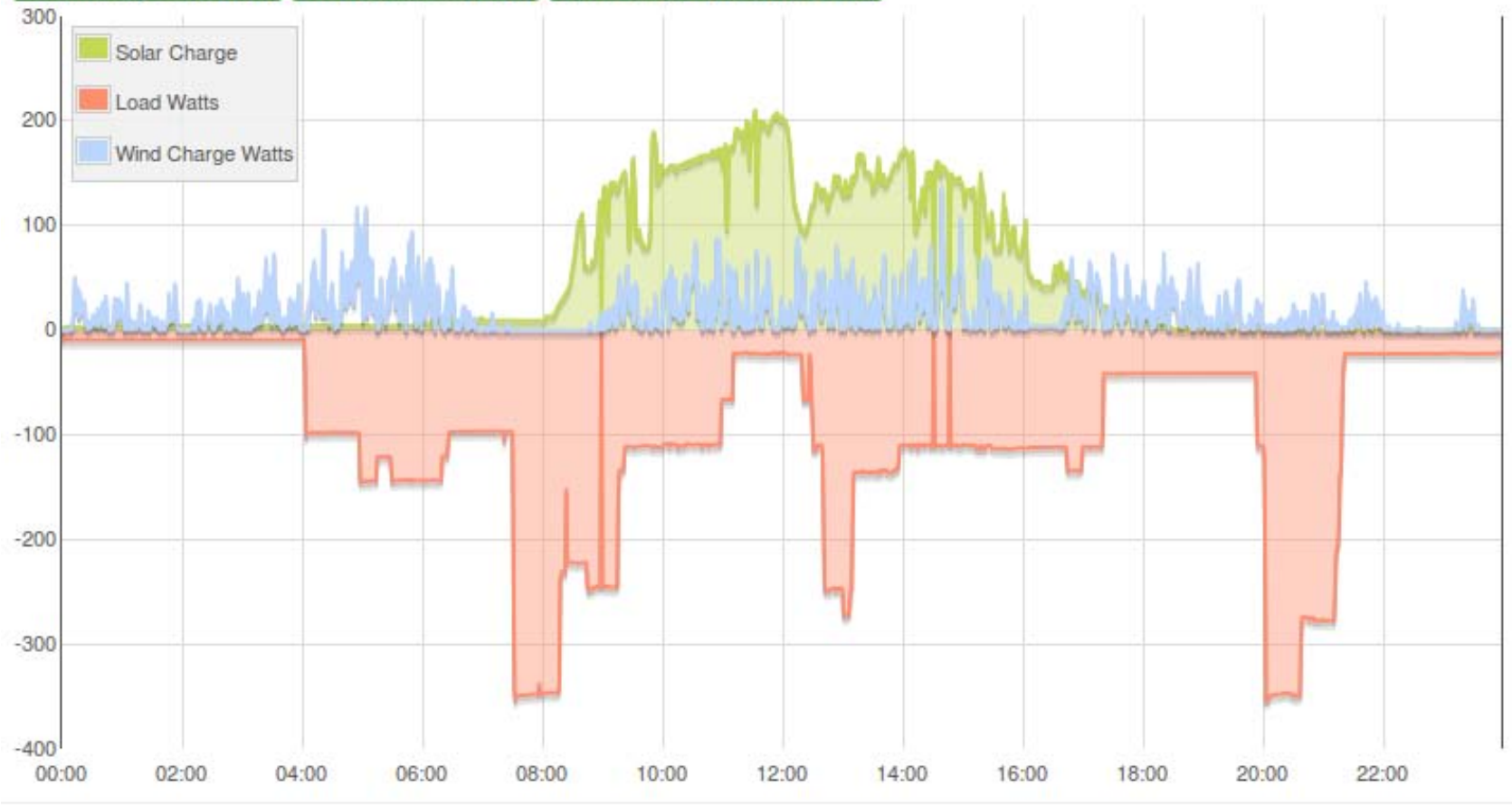


# Live Data Feed

## Energy In and Out in Watts Graph on 09/08/2013

< 09/08/2013 > Day View Month View

Solar Charge: 1.17 kWh Load Watts: 2.37 kWh Wind Charge Watts: 0.40 kWh





# Wind Requirements

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Require 4m/s annual average or better for battery charging systems

For wind-electric waterpumping require 5m/s+

Use CWET wind data as a reference (new windmap)

If in doubt, use datalogger and measure at site  
New arduino logger, open source, low cost

Installer MUST be trained on how to install a wind turbine.

Highly site specific



# Example mountain mini-grid

2 Technicians build turbine from scratch as apprentices at Minvayu. Reach site 2 days walking



Gain skills to not only maintain and install system, but also to replicate construction at their own village





# Keep it simple

Turbine is AC 220V variable frequency. Village grid is connected directly. Rectify/charge battery at household

3m Turbine

800W rated at 10m/s

220V operation

Variable frequency grid

Mini-grid for basic lighting for 40 homes

Excess energy to heat water

Turbine can run AC 220V pump or variable rpm productive application directly. No inverter needed







# Pipeline

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Develop lower cost turbines:  
30% less by end of year

Create support for RE installers nationally

Promote open-source innovation network

Expand Trainings at National level

Include trainings for small/pico hydro



# MinVayu Contacts



Manufacturing:  
MinVayu Project  
Windarra Farm  
Auroville 605101  
Tamil Nadu

Office:  
MinVayu Project  
CSR Building  
Auroshipam  
Auroville 605101  
Tamil Nadu

Jorge Ayarza  
Founder

Email: [Jorge.ayarza@gmail.com](mailto:Jorge.ayarza@gmail.com)  
Skype [jorge\\_ayarza](https://www.skype.com/en/contacts/jorge_ayarza)  
Cell: +91 9786296441

[www.minvayu.org](http://www.minvayu.org)