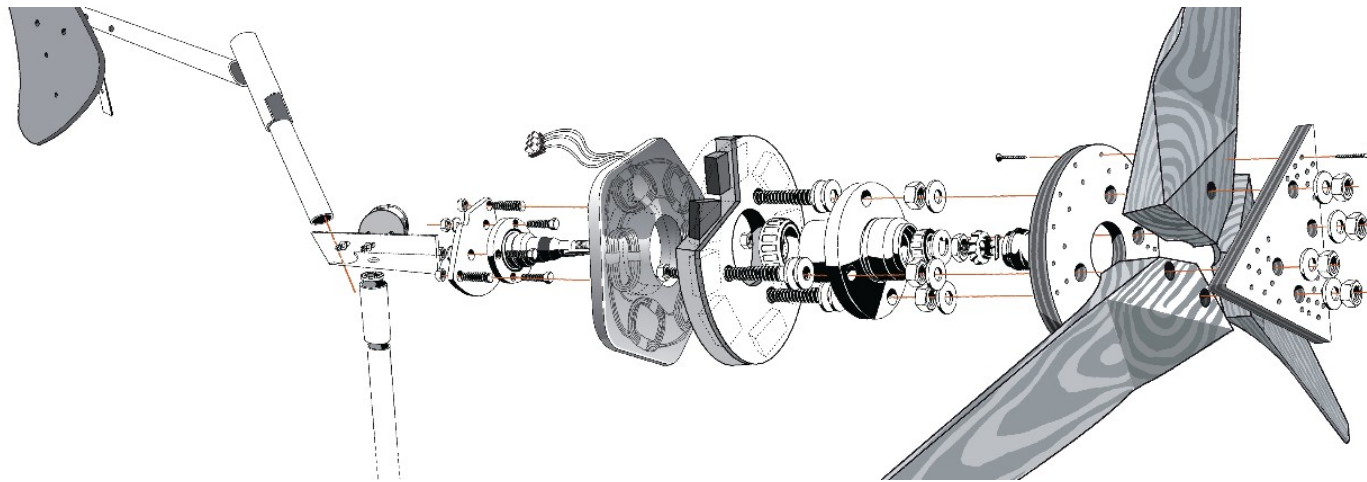


Teaching Electrical Engineering – The Wind Empowerment Way

Luiz Fernando Lavado Villa
luizlavado@gmail.com
Technology WG Coordinator



Energy Access: A World Challenge

- About 1.5 Billion people do not have access to electricity
- Energy is a main factor for development
- Energy is shaping the conflicts in modern society

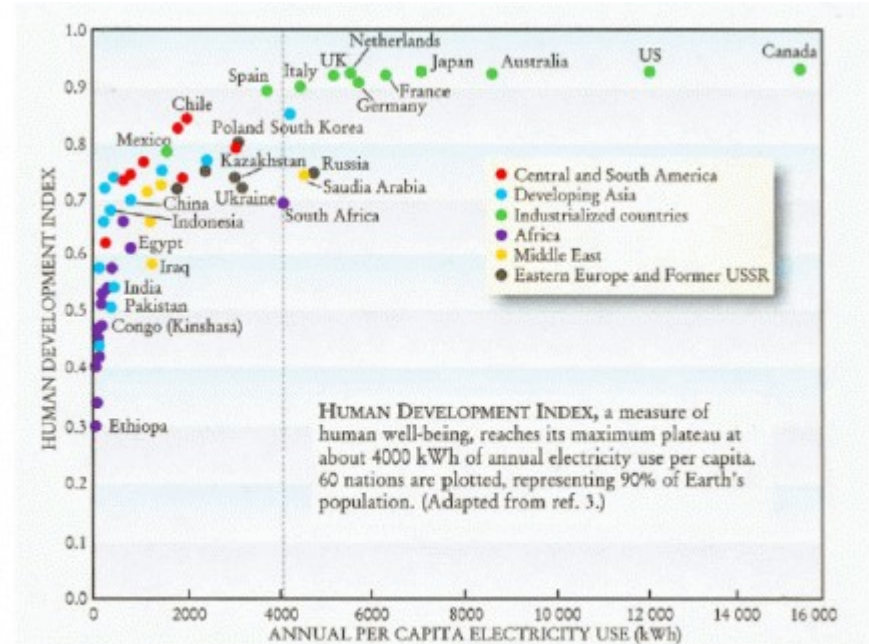


Figure 1.2. Human development index vs. per capita electricity use for selected countries. Taken from S. Benka, *Physics Today* (April 2002), pg 39, and adapted from A. Pasternak, Lawrence Livermore National Laboratory rep. no. UCRL-ID-140773.



An Answer: Local Energy Manufacturing

- Explore local resources
- Tap into local knowledge
- Technology transfer and local maintenance



500 RPM - Argentina



COMET ME - Palestine

The Challenge: Keeping up an electric grid

- Assembling a grid is a tricky thing
- Some elementary problems: Sizing, storage, local energy resource estimations
- Technology needed: Power electronics, electric machines, remote monitoring, etc

COMET ME - Palestine



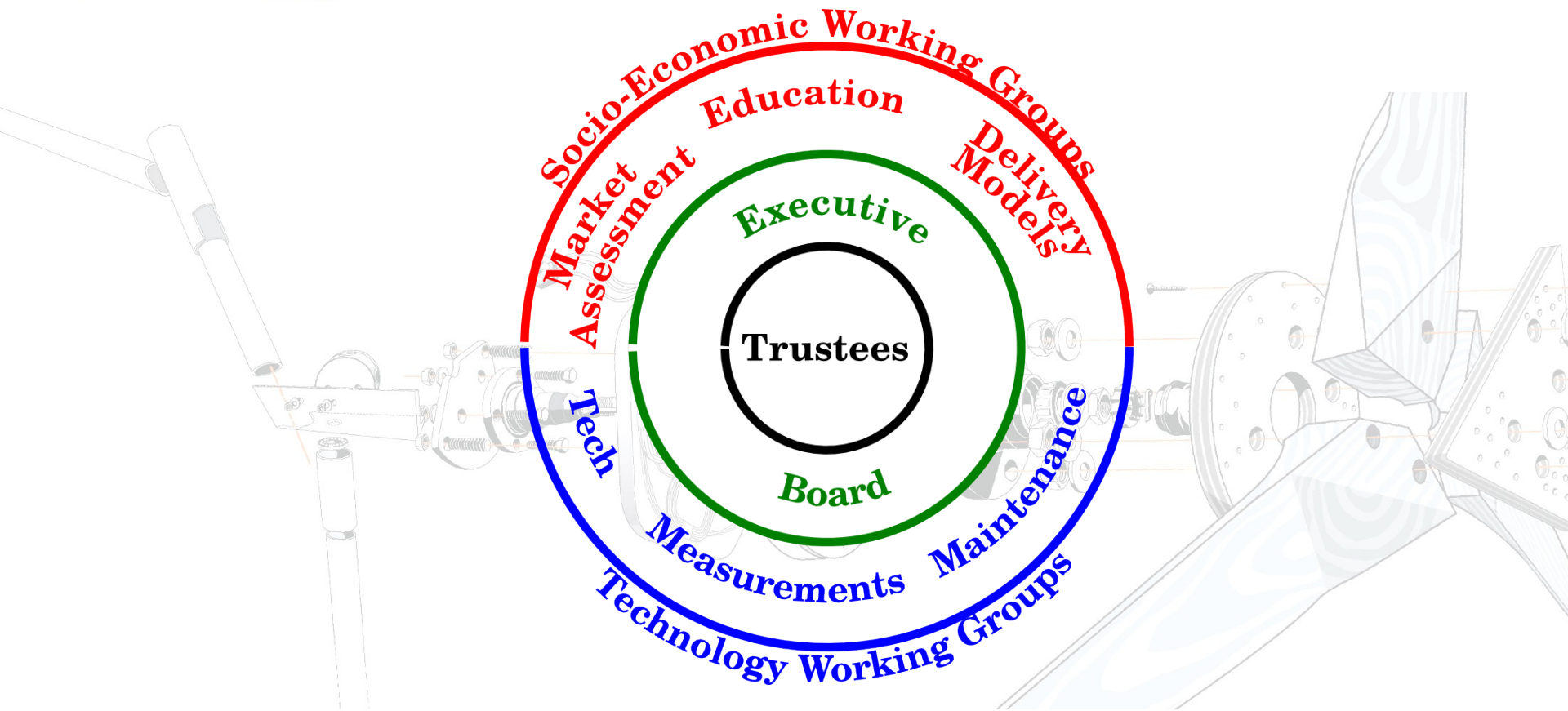


A collective Answer: Wind Empowerment

- Global network for the promotion of Small Wind Turbines
- More than 40 members in 5 continents
- Composed mainly by Universities, Small companies and NGOs



How does W.E. work?





Our Way: The Wind Turbine Workshop





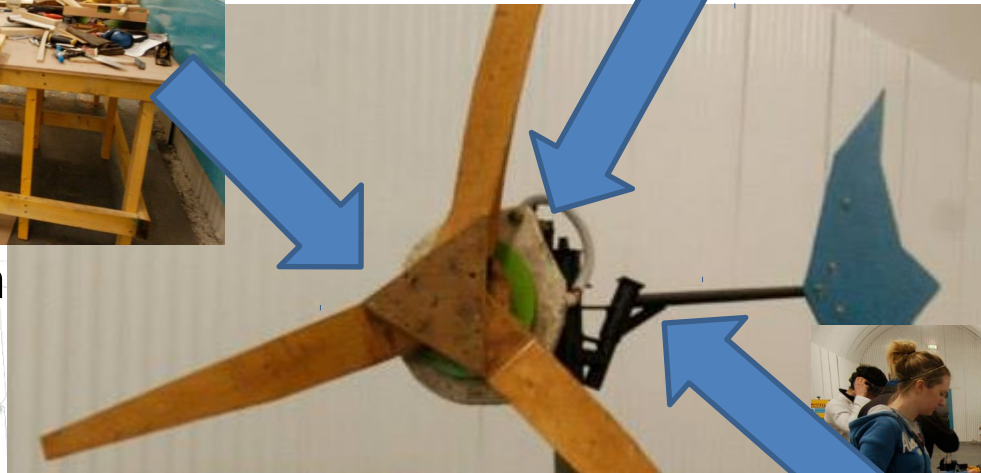
Our Way: The Wind Turbine W



Electric Workstation



Wood Workstation



Metal Workstation



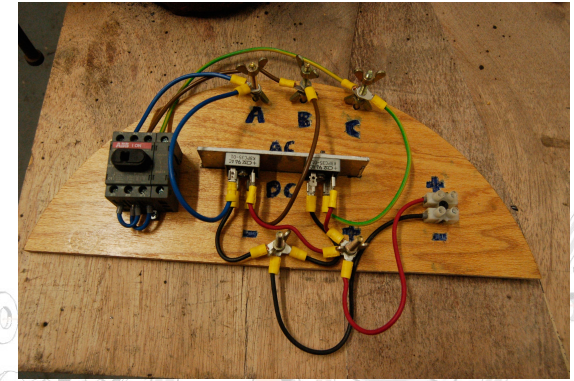
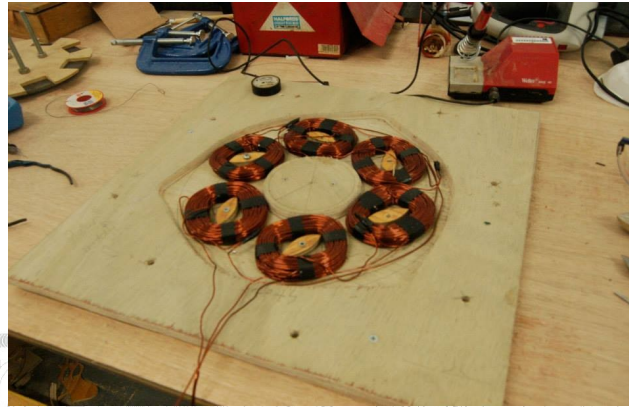
The Wood Workstation



Metal Workstation

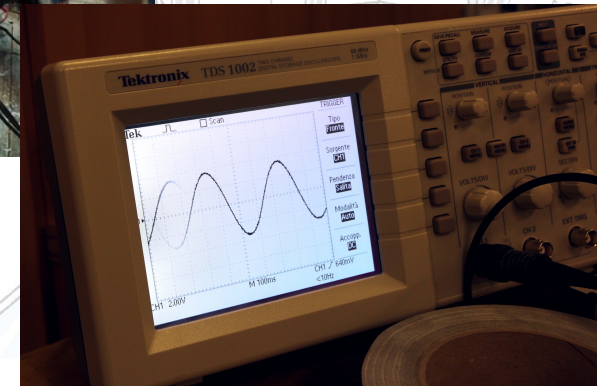


Electric Workstation



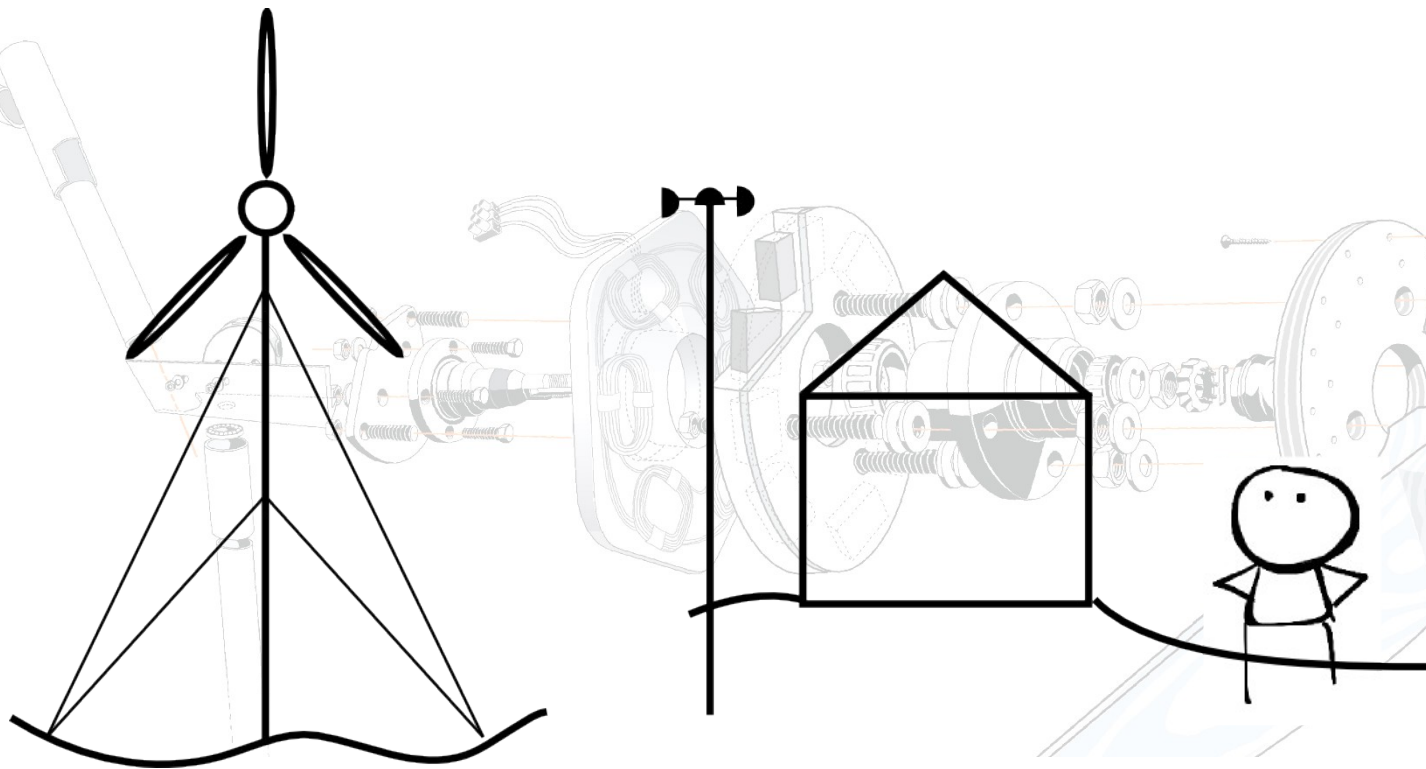
Teaching Electrical Engineering on the field – A Live DEMO

- AC voltage @ 60 rpm
 - 1.2m machine = 1.9V
 - 1.8m machine = 2.3V
- Oscilloscope view
 - Link V & Speed
 - Number of poles

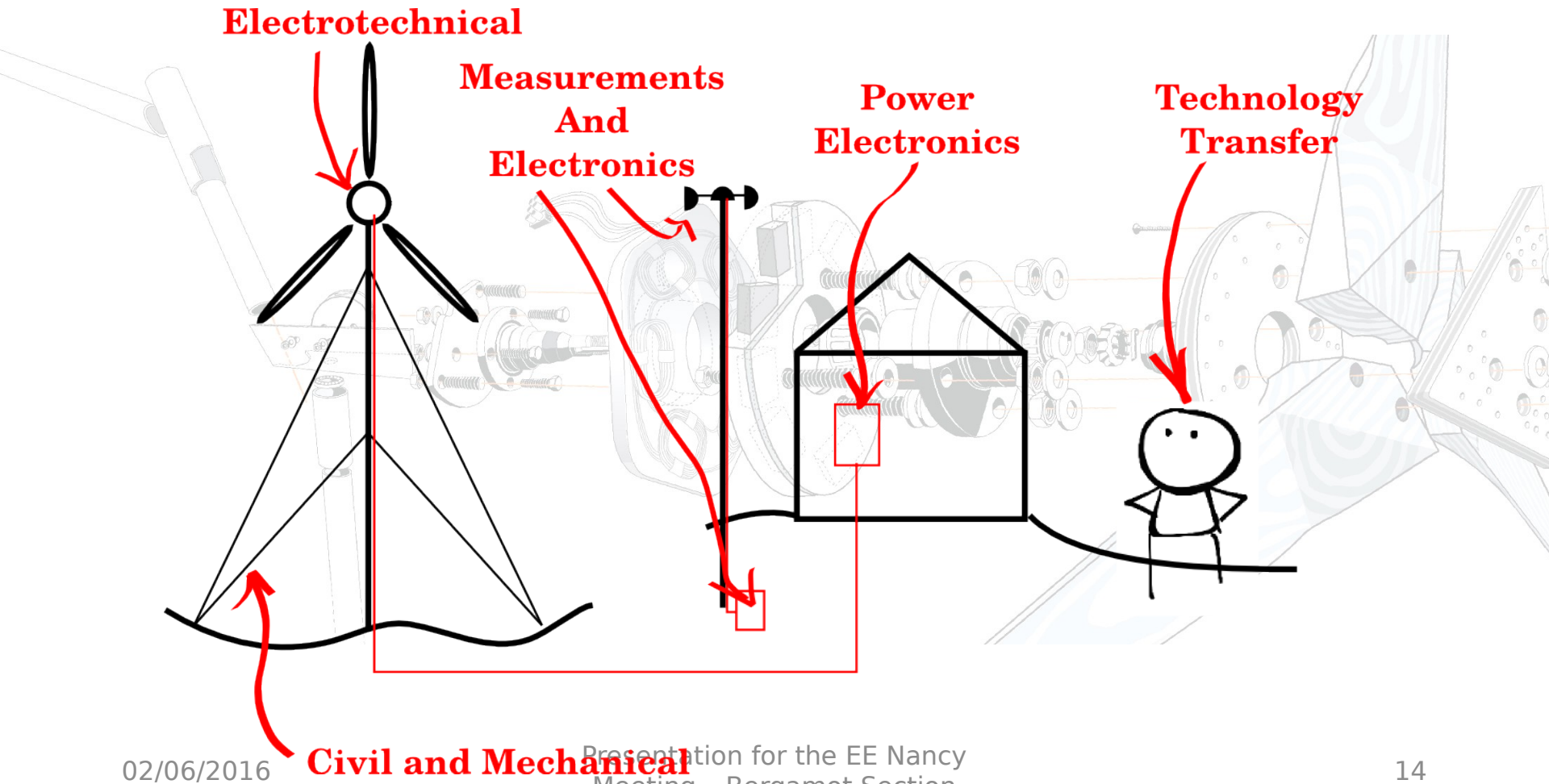




How W.E. help the IUTs and vice-versa?



How W.E. help the IUTs and vice-versa?



Current Projects – Open-Source Charge Controller Project

- To build an open-source charge controller for DC buses
- 1 technical student internship
- In collaboration with EolSenegal



Current Projects – Modular Power to the People Project



To create a power electronics converter which is easy to build and open for improvements by a community of users

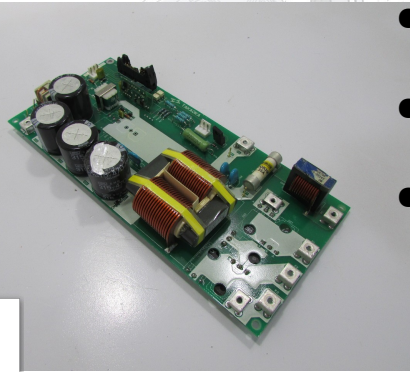
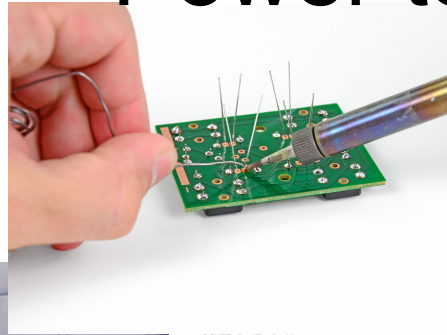


Current Projects – Modular Power to the People Project

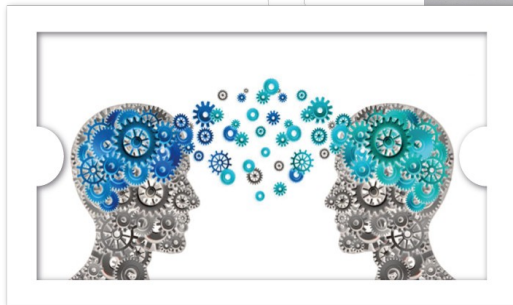


- 6 partners involved in the project
 - Argentina – QMAX and INTI/UPA/L&R Ing.
 - Peru – WindAid
 - UK – Re-Innovation
 - France – ACE
 - Austria - PureSelfMade

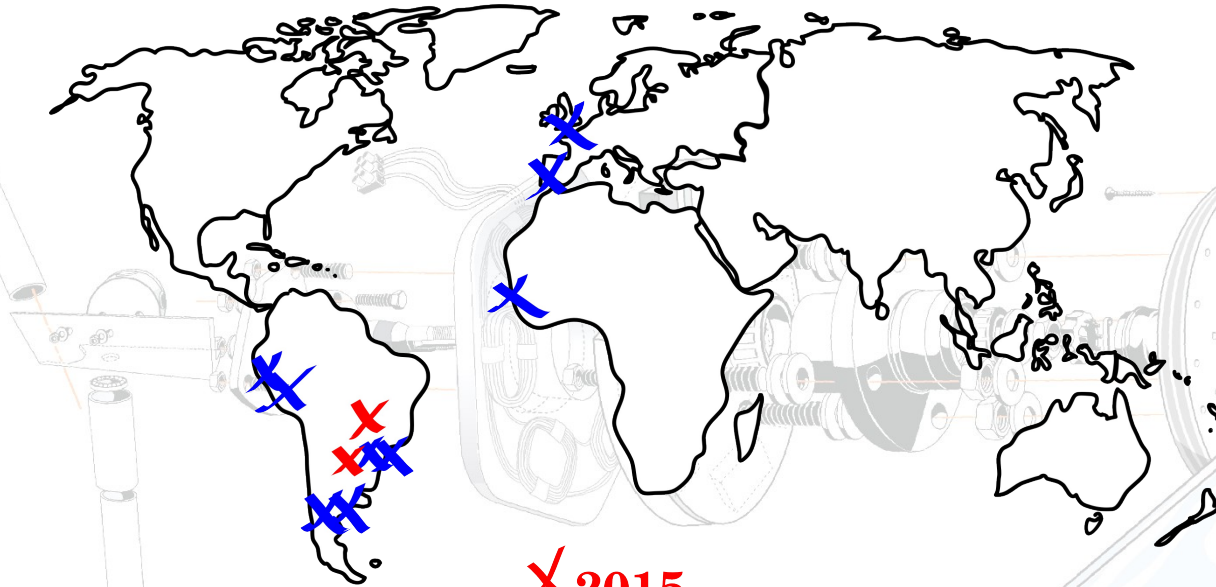
Current Projects – Modular Power to the People Project



- Project divided in 4 parts
- 1. Training
- 2. Design and creation
- 3. Assembly
- 4. Dissemination



International Internships



X 2015

X 2016

French Context Internships



Tripalium





The TechWG Open-Source Initiative

- To develop low-cost open-source solutions to the problems emerging from the needs from the field
- Not limited to the electrical part

Future projects

- Creating a full open-source based electric system installation
- Test it on field conditions
- Creating an open-source wood lattice tower
- Work on standards for helping WE members in their installations
- Create open-source test rigs
- Create open-source blade cloning machines