

PV-HYDRO WITH SMART HYDRO POWER + STUDER INNOTEK



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STUDER INNOTEC

- Swiss manufacturer of power electronics
- 30 years of experience and expertise in off-grid electrification
- leading the market with a range of more than 60 standard models



INVERTERS, SERIES AJ

➤ Brings simple solutions for small off-grid electrification

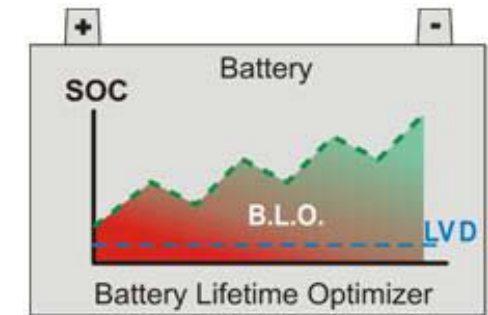
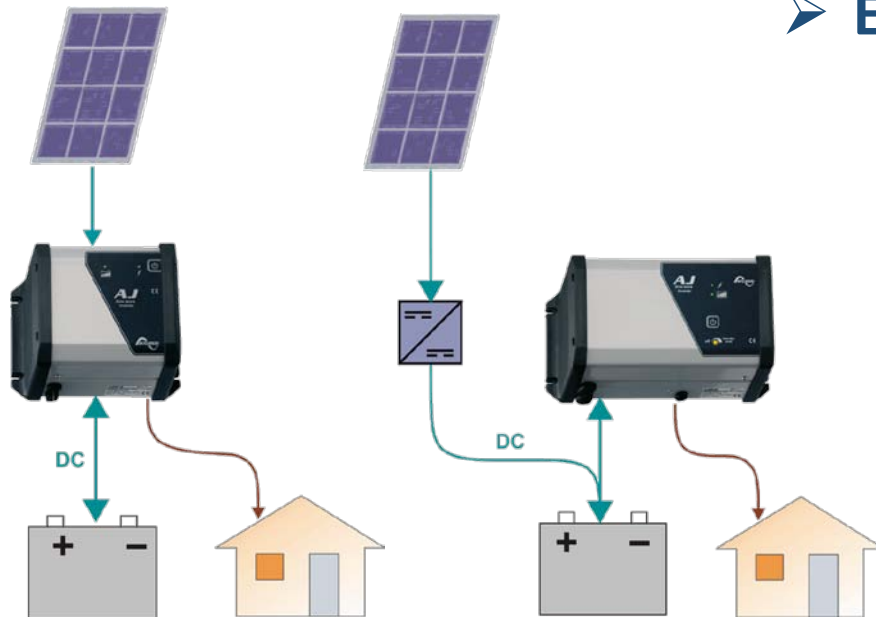
➤ More than 100'000 units in the field today

➤ Easy implementation

➤ Mature technology

➤ Cost effective

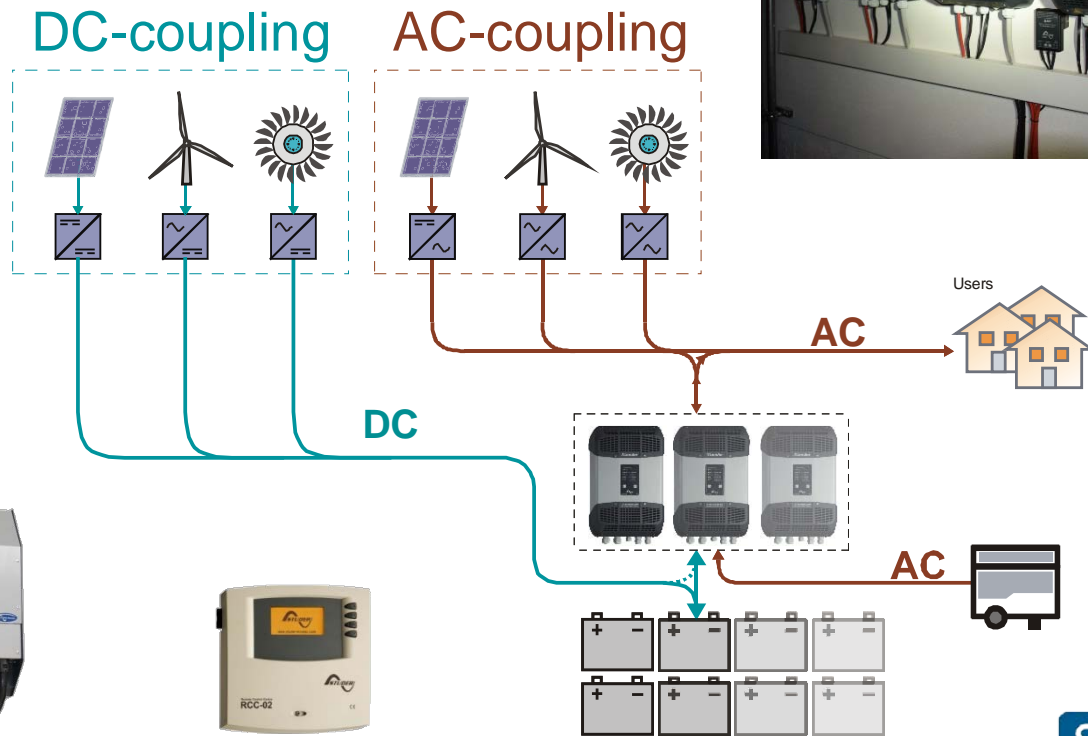
➤ B.L.O.





INVERTER/CHARGERS, SERIES XTENDER

- Serving any kind of topology
- from 1kW hybrid solar system
- up to 72kW distributed mini-grid





MPPT SOLAR CHARGE CONTROLLERS, VARIOTRACK AND VARIOSTRING



**Highest efficiency:
Get the best from your PV generator**



- Best in class MPPT solar regulators
- Up to 15 units in parallel
- 4 STEP charger
- Fast and MPPT (>99%)
- Best efficiency (> 98%)
- <1W in night mode





awards
solar
WINNER 2014



IT'S ALL ABOUT COMMUNICATION !



COMMUNICATION IS ALL ABOUT IT !

**Smart Hydro Power
village electrification with
PV-hydro in Marisol, Peru**

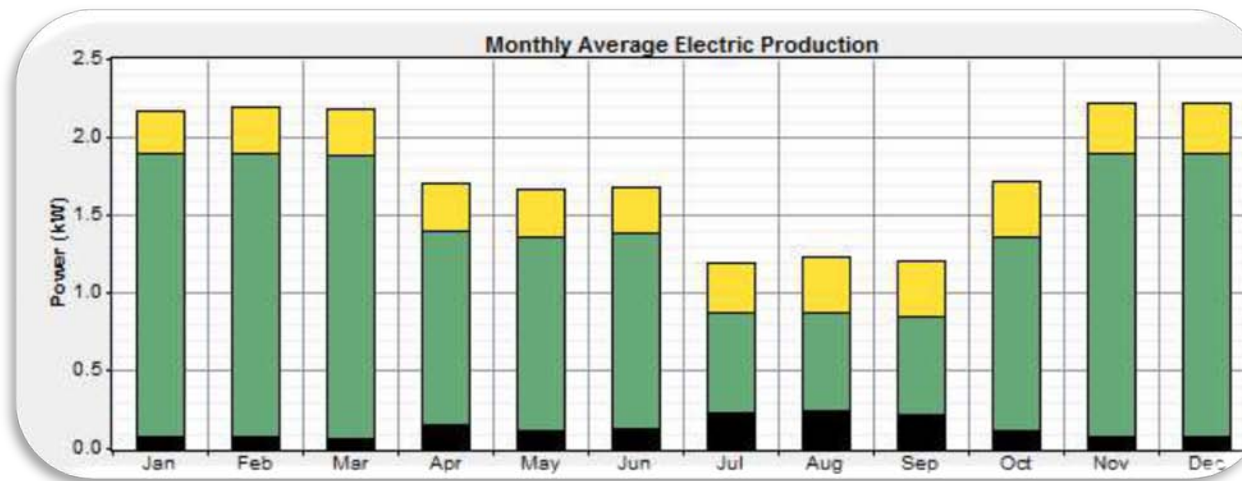
 Marisol – a reference village in Peru



- 45 households
- Cocoa plantation
- A school and a basic workshop mainly for carpentry
- Electricity from diesel for 4-6 hours per day

 The Hybrid System designed for this profile

- Rio Huayabamba: 1.2m/s -2.2 m/s
- 4 kW SMART Hybrid System: hydrokinetic turbine (5kW)+ photovoltaic panels (1,5 kWp) + 5kW gen-set and + 16kWh battery bank..



- Figure 5: Monthly distribution of power production across the 3 sources: green = SMART turbine, yellow = solar PV, black = diesel generator

 Marisol – with the SMART Hybrid System

- Sustainable energy
- year round electricity
- available for productive use
- internet café

Soon:

- Water treatment
- for 24 hours (TTA meters)





SMART Electrical management system

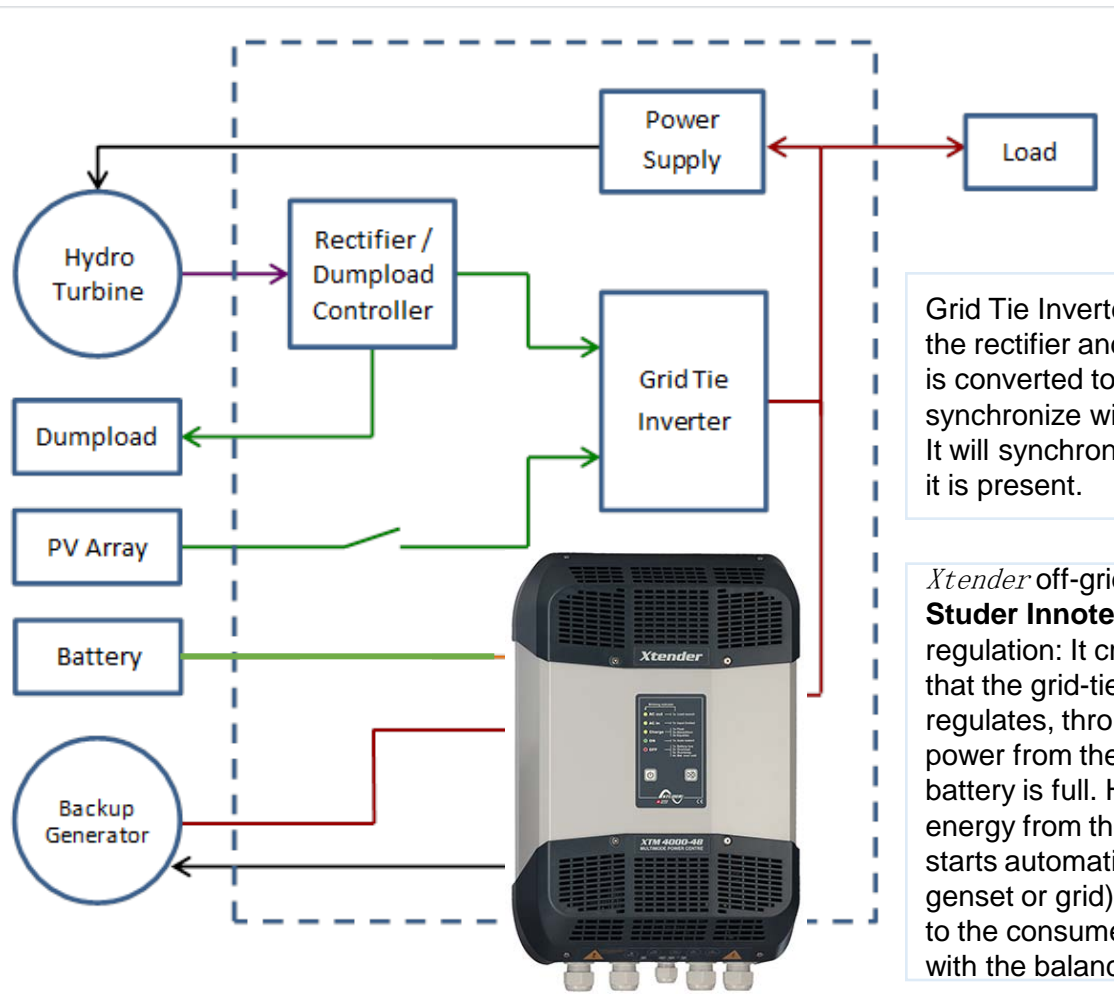
SMART Monofloat, Duofloat, or Freestream turbines from Smart Hydro Power. Produces a varying AC voltage and up to 5 kW of power.

Dumload – Dissipates the power as heat.

PV Array – Photovoltaic array. Generates a varying DC output. Complements the power generated by the hydro turbine.

Batteries – Typically a 48 V bank of deep-cycle lead-acid type batteries or similar technology.

Backup generator – Automatically started by the off-grid inverter when the system does not produce enough power. Generates a pure 230 VAC output.



Grid Tie Inverter – Accepts DC inputs from the rectifier and the photovoltaic array. This is converted to 230 VAC and must synchronize with an existing 230 VAC grid. It will synchronize with the off-grid inverter if it is present.

Xtender off-grid Inverter-charger from **Studer Innotec** is the core of the system's regulation: It creates a stable 230 VAC grid that the grid-tie inverter synchronizes and it regulates, through frequency shift, the power from the hydro turbine when the battery is full. He provides the balance of energy from the battery and, if required, starts automatically a backup source (diesel genset or grid), synchronizes and connects to the consumer, and recharges the battery with the balance of power



The Hybrid System LCOE

Sensitivity		Architecture								Cost				System			
Hydrokinetic Scaled Average (m/s)	Solár Scaled Average (kWh/m ² /day)						PV (kW)	Gen (kW)	Bat	SMART	Converter (kW)	Dispatch	COE (€)	NPC (€)	Operating Cos (€)	Initial Capitz (€)	Ren Frac (%)
0,70	5,26						8,0	5	16		4	CC	0,52 €	80.381 €	2.879 €	37.200 €	54,4
1,77	5,26						1,5	5	16	1	4	CC	0,29 €	44.472 €	768 €	32.950 €	89,9



This system guarantees the cost kWh below 30€cent/kWh, for the initial capital cost lower than for only PV.

 **SMART Solutions for rural electrification**

SHP develops and commercializes environmentally friendly kinetic micro hydropower systems as the backbone for our rural electrification solutions.



SMART MONOFLOAT TURBINE

Up to 5kW submerged river turbine for locations with high incidence of debris



SMART HYBRID SYSTEM

Photovoltaic panel combined with the river turbine, complement each other for the productive use of energy



SMART FREE STREAM

5kW river/canal turbine fixed to the river bottom – requires only 1,1 m depth



CUSTOMIZED SMART SERVICES

Local partners, Electric Management System and trainings



 SMART Installations



SMART Free Stream - Germany



SMART Hybrid System - Colombia



SMART Hybrid System - Peru



SMART Monofloat - Nigeria

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