# SMART ENERGY MANAGEMENT SYSTEMS

## SMART ENERGY MANAGEMENT SYSTEMS

The Electrical Management Systems, or EMS, are the brains of our renewable energy systems. They maximize the usage efficiency by balancing the supply of electricity between the varying user demands. The proprietary load management system developed for the SMART EMS allows for loads to be prioritized according to the usage profile, optimizing energy consumption. Integrated inside the electrical cabinet is a reverse control (to remove accumulated debris from the blades), optional auxiliary devices, customizable battery storage interface (it has a built-in battery charger) and monitoring system.

Available grid-connected and off-grid

Expandable modular system

## OFF-GRID SYSTEM (AC/DC)

Distributed generation requires load management, which is what this system offers:

- Load shedding
- Auxiliary load control
- Load shaping
- Integrated battery charger (48 V bus)
- Tariffing
- Output frequencies: 50 Hz / 60 Hz
- Output voltages: 230-240 V /110-127 V AC / 48 V DC

Possible three-phase power supply

Standardized

AC DC

Manages power flow between user, auxiliary loads, battery storage, and load bank dispersion

### Off-grid Inverter

Regulates power to and from the batteries. It creates a stable 230 V AC grid that the grid-tie inverter synchronizes to. If the entire system does not produce enough power for the attached load, it supplies power from a backup generator which is automatically started, or from a backup power grid

### Optional

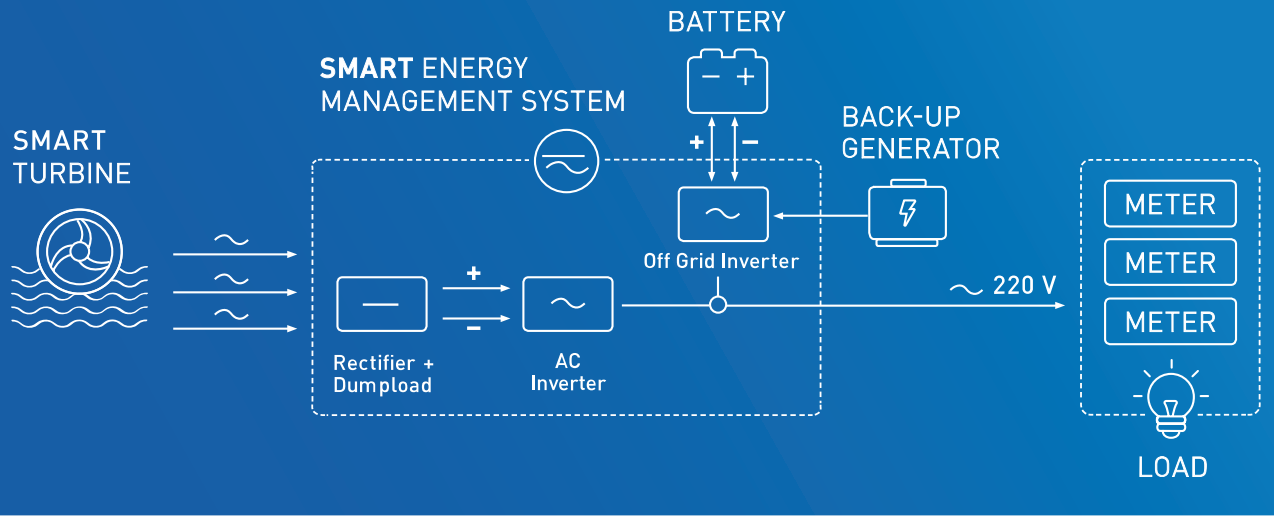
- reverse control
- customizable battery storage
- optional auxiliary devices
- monitoring system

### Grid-tie Inverter

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

### Rectifier

Rectifies the varying AC voltage from the hydro turbine into a varying DC voltage. Applies the external resistive dump load when the DC voltage exceeds 500 V DC



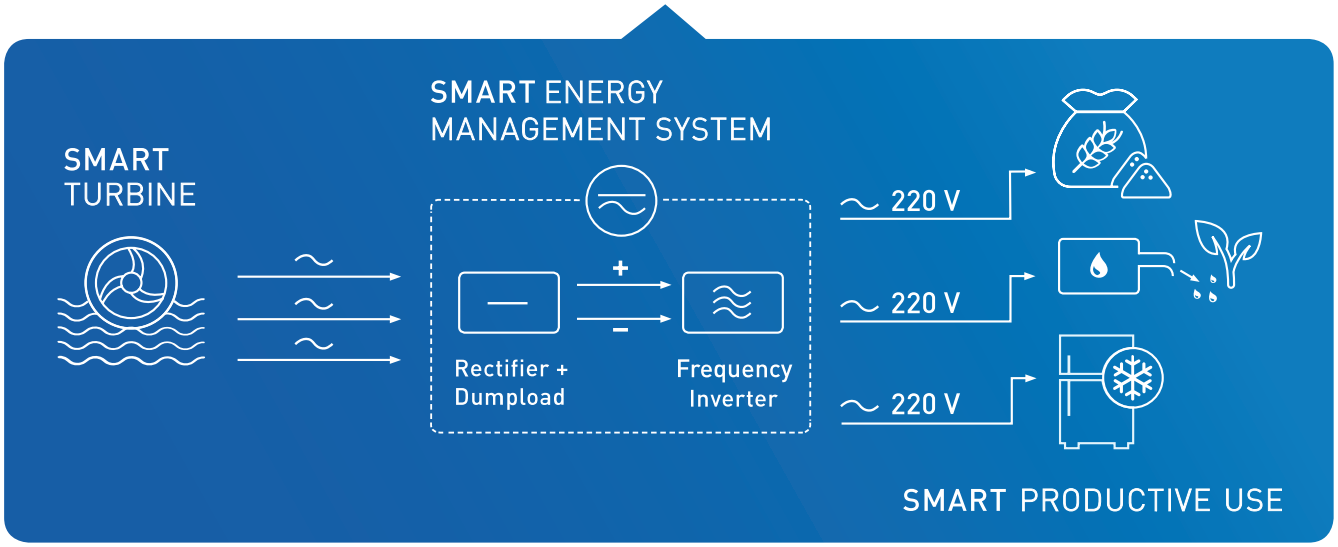
## FREQUENCY INVERTER

This system is the most cost-efficient way to operate productive use appliances through clean energy along rivers. This solution enables direct-driven productive use, since all the energy produced is consumed, according to the circumstances. The frequency controller adapts the rotational speed of the motor, which drives the mechanical systems, allowing the operation of a pump, mill, or cooling appliances.

No need for battery

Cost-effective three-phase power supply

Ideal for productive use




## GRID-CONNECTED SYSTEM

A grid-connected system is particularly useful in backup applications where grid power is available but expensive or potentially unreliable. The hybrid version offers on the one hand a hedge of the electrical power supply by the grid (in case of failure of the production or partially increased demand) and on the other hand a buffering of the local production with a feed of the excess current.

Power fed into low voltage grid

Stabilizes the grid

### Rectifier

Rectifies the varying AC voltage from the hydro turbine into a varying DC voltage. Applies the external resistive dump load when the DC voltage exceeds 500 V DC

### Grid-connected component

Performs safety relay supply and turbine maintenance control

### Grid-tie Inverter

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

### Monitoring

GPRS, Wi-Fi, Ethernet) monitors energy, power, and voltage online and has an inverter control