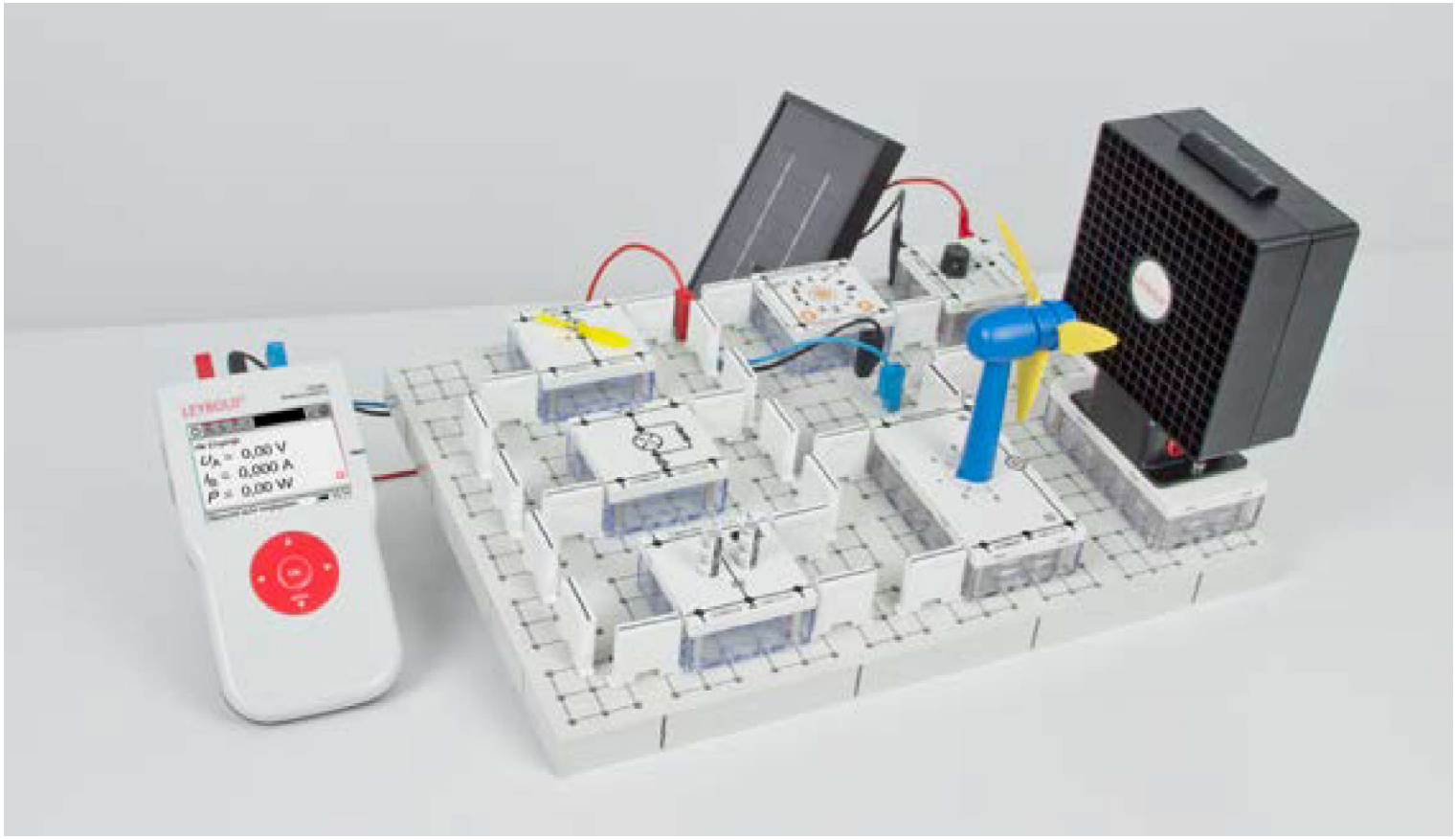
RENEWABLE ENERGY

LEYBOLD PLUG-IN SYSTEM STE



TOPICS

AND SCOPE OF EXPERIMENTS

- Fundamental principles for power generation using photovoltaics and wind energy as well as the fundamental principles for energy storage systems
- Analysis of the power fluctuations in grids drives, photovoltaic systems and wind energy plants
- Experiments on supplying a building using conventional power stations and in combination with photovoltaic systems, wind energy and energy storage
- Experiments on voltage behaviour in a radial distribution network with photovoltaic systems depending on consumption, and with the implementation of intelligent local network stations, energy storage and load management
- Scenario experiments for conductor cable monitoring and for more complex Smart Grid systems as well as their behaviour in the case of a fault

The proportion of renewable power stations has now reached a point such that security of supply based on tried and tested grid principles can no longer be guaranteed.

„Smart" concepts, which provide the integration of smart grid components can solve these problems. However, the resulting changes are extensive. Current consumption-oriented generation will have to convert to production-oriented consumption with associated changes to training requirements.

The LEYBOLD STE „Smart Grid" has demonstrative experiments on these topics:

- Volatile production
- Operation of the conventional power grid
- Problems with the integration of renewable energies
- Operation of „smart" energy solutions

STE SMART GRID

The interpretation of the gained measurement values enables interesting lessons that, used alongside technical competence, develop particularly the communication and evaluation capabilities of students.

LEARNING OBJECTIVES

- Characteristics of various power generation technologies
- Coupling and controlling various energy generation systems
- Comparison of generation and load profiles

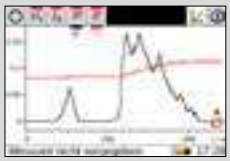
ADVANTAGES

- A cost-efficient alternative to large-scale equipment, offering comparable learning content
- Construction of different scenarios and topologies by learning groups
- Interfaces to computer simulations and controllers are prepared
- Optimised for CASSY measuring systems

580 0400	STE Smart Grid

ADDITIONAL COMPONENTS

WIND GENERATOR WITH INTERCHANGEABLE BLADES



The wind turbine consists of a base unit and the rotor essays. Up to 24 different wind rotors can be mounted on the wind turbine. Thus the efficiency of the different designs can be studied. By combining with the „Smart Power Source" day balances of various construction forms can be compared. (*Fig. shows moderate wind at the country side measured by the Mobile-CASSY 2*).

580 0133	Wind generator 4/50
580 0135	Wind generator 4/50/100
580 0138	Set of wind rotors

SOLAR MODULE

The solar module is representative for a photovoltaic system and the lamp for the sun. By turning the module, the change of the angle of incidence to the PV system based on the position of the sun, is demonstrated. Experiments on the efficiency by heating or shading can be realized easily.

580 0113	Solar module 5,22 V, 380 mA
580 0129	Stand solar module
580 0130NA	Table lamp without lamp
580 0131	Lamp 120 W

SMART POWER SOURCE – INTELLIGENT POWER PLANT SIMULATION

This component is the core of the smart grid system. The smart power source is a voltage and power source that simulates the behavior of photo-voltaic systems, wind generators or power plants over a day. 10 s in the experiment correspond to an hour (240 s per day). The current time is displayed by the LEDs. Many different modes can be set manually via the touch function (weather, type of power plant, faults). In addition, a control by the PC and thus a synchronisation of several generators in a „smart grid" scenario can be performed via the existing USB interface. Experiments on the stability of the grid and planning of energy generation can also easily be performed.

580 0402	Smart Power Source