Project SUDOE Improvement: Monitoring and LNEG's Pilot Plant control

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Ana Estanqueiro (Coordinator),

David Loureiro, João Correia, Laura Aelenei, Jorge Facão, Carlos Rodrigues, Volodymyr Pobuta

Portuguese Pilot area (LNEG & IST)
Laboratory for Integration of Renewable Energy, LNEG/Lisbon

Integration of endogenous renewable generation in a nZEB building

Monitoring system: Quantities & parameters

Comfort

- Air temperature and relative humidity, C02, and lightning;
- Surface walls temperature;

Thermal

- Heat Pump operation and power consumption;
- Energy Enthalpy Meters;
- Water (hot/cold) water pumps operation parameters (time schedule, temperatures, flow);
- Thermal water storage tanks temperatures;
- Fan Coils time schedule and power consumption;

Electrical

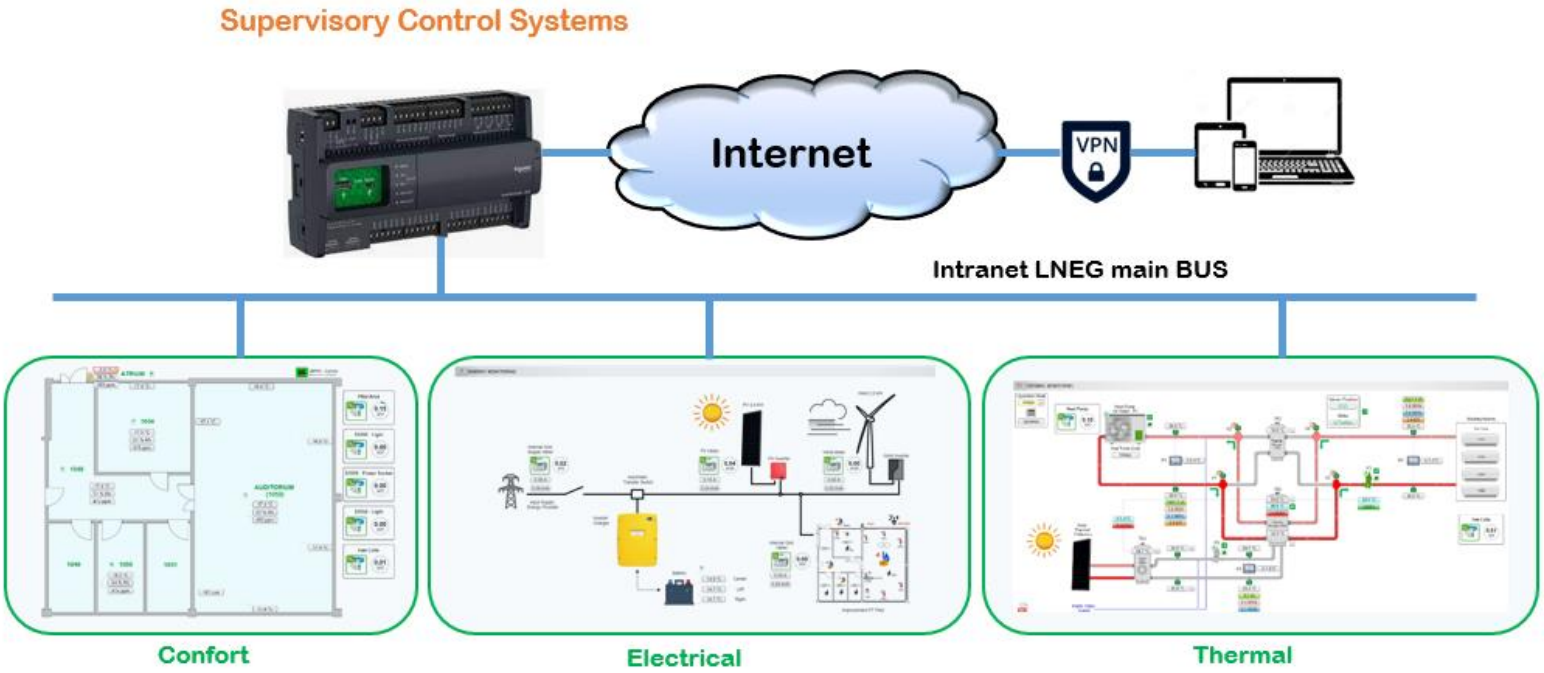
- Pilot area energy consumption by the existing loads (Ex. Lights, Schuck plugs, Climatization);
- Energy produced from renewable sources in building “C”;

Weather Station

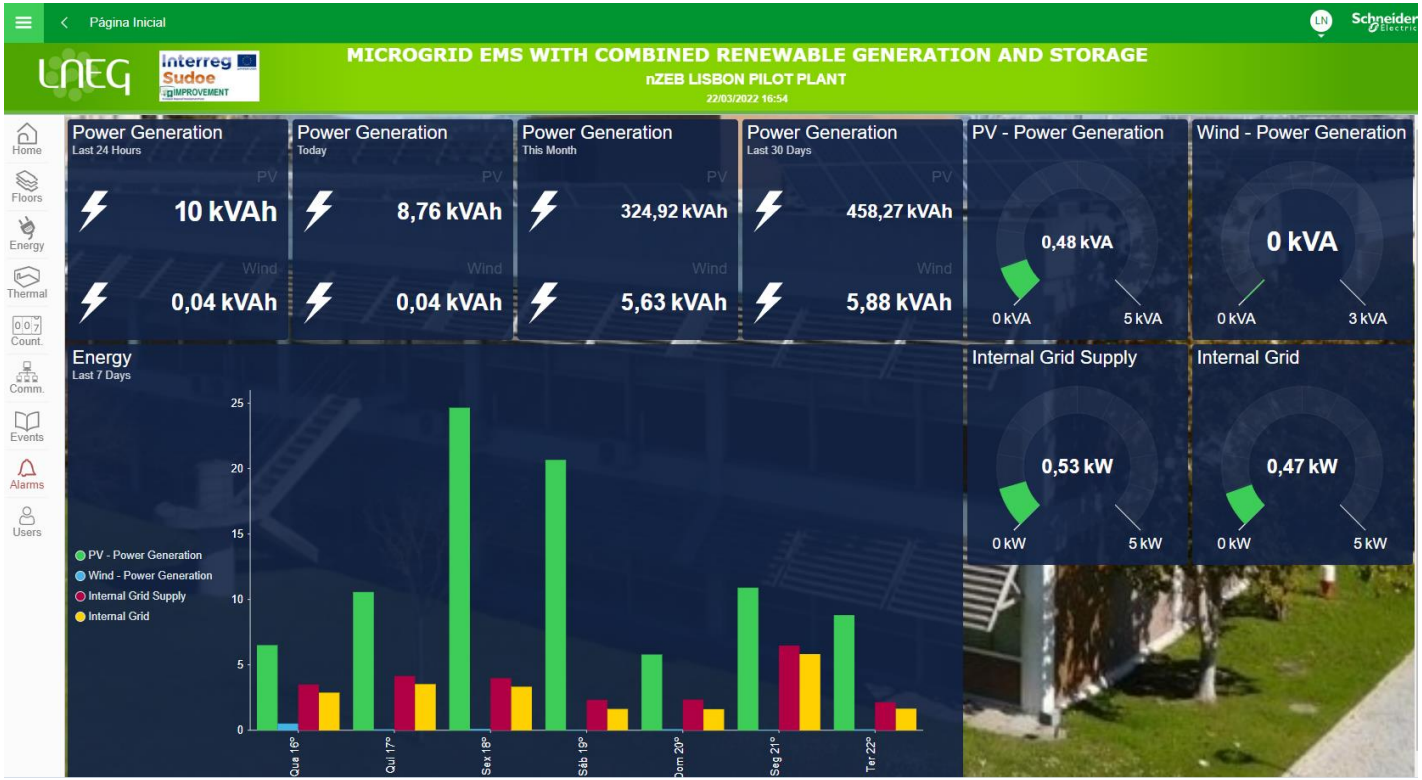
- Solar irradiation; Air temperature and Relative Humidity; Wind velocity and direction.

Monitoring Concept and Design

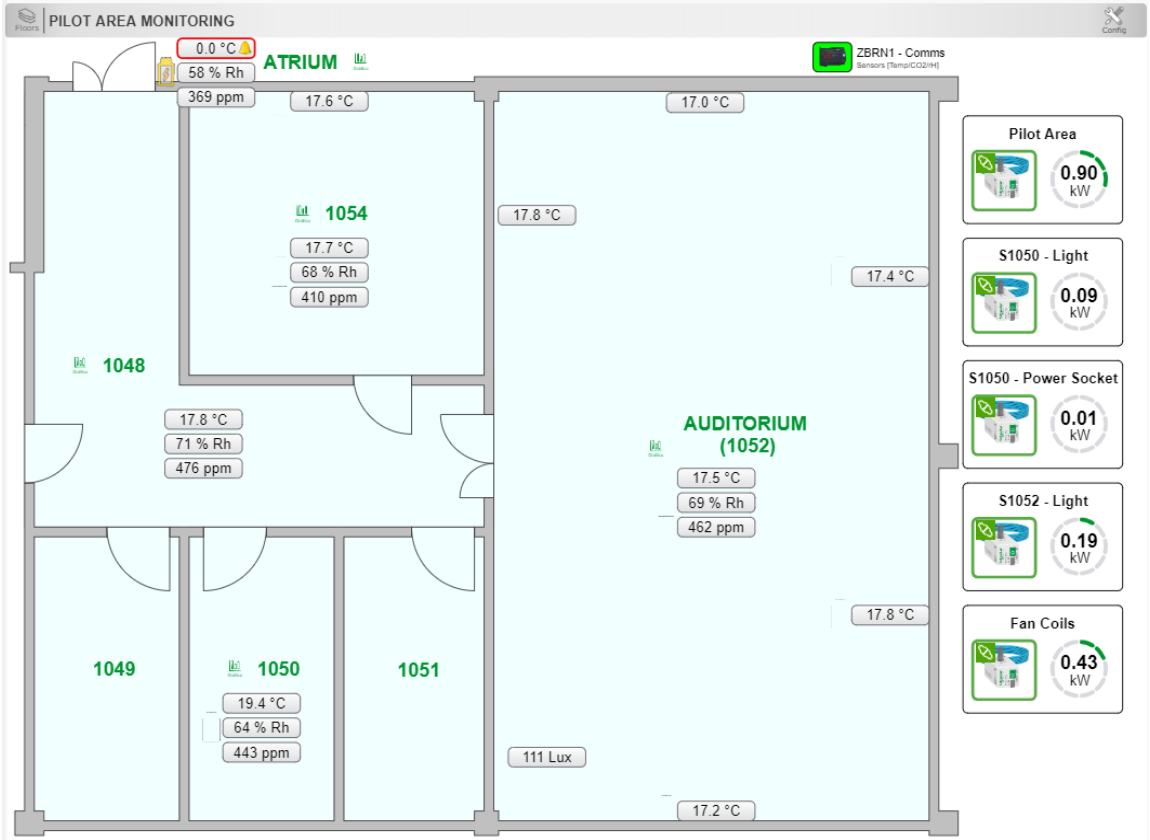
Monitoring - Global System



Monitoring system homepage (web interface)



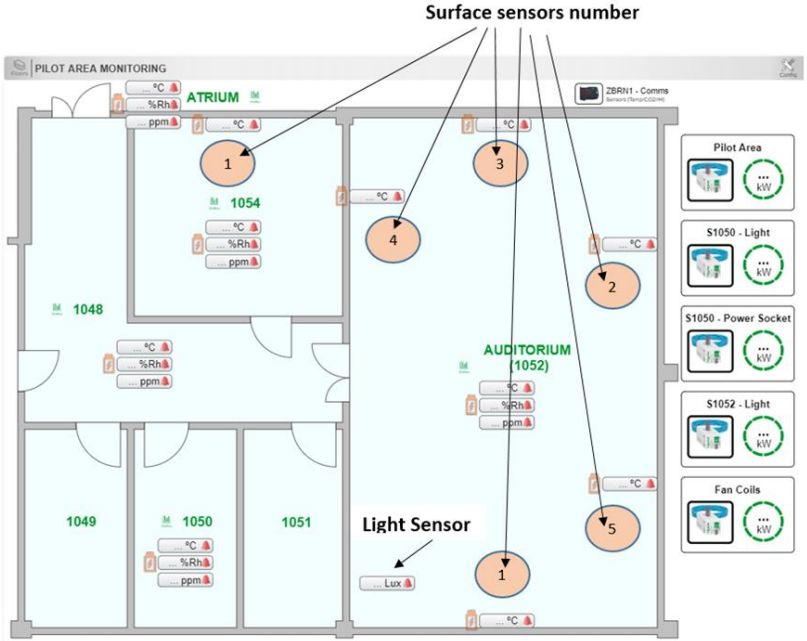
Pilot Area – Comfort and Consumption Monitoring (web interface)



Assessment of comfort:
Measurement of wall surface temperature

Monitoring the comfort levels and air quality

- Set of wireless sensor
  a. air temperature,
  b. relative humidity and
  c. CO2 concentration levels.



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Monitoring of RES generation

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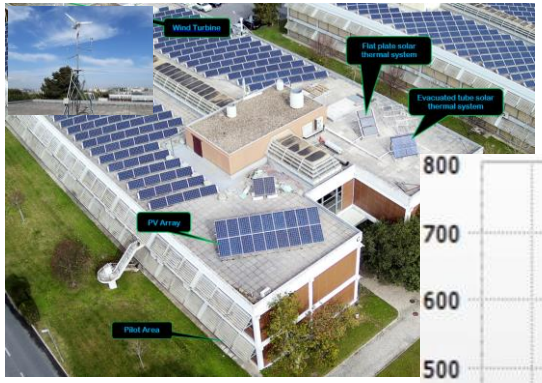
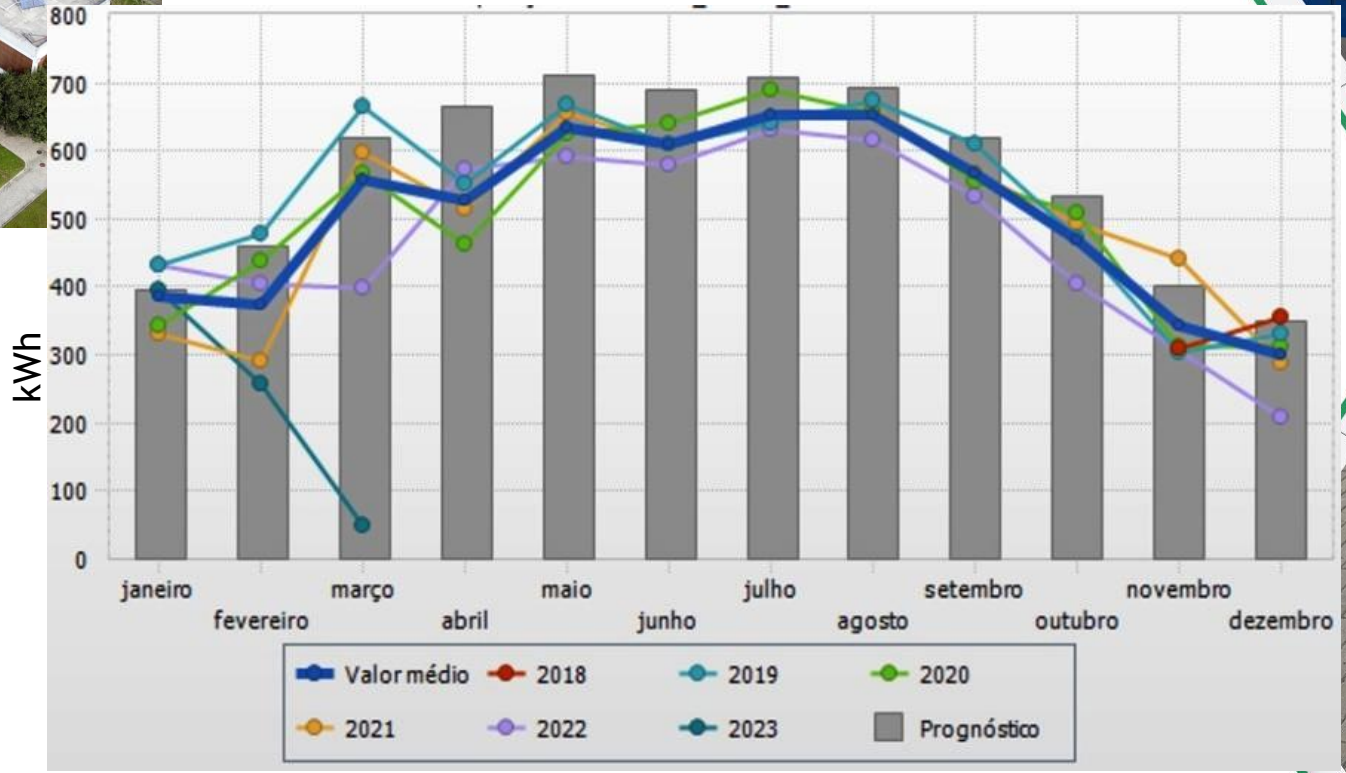
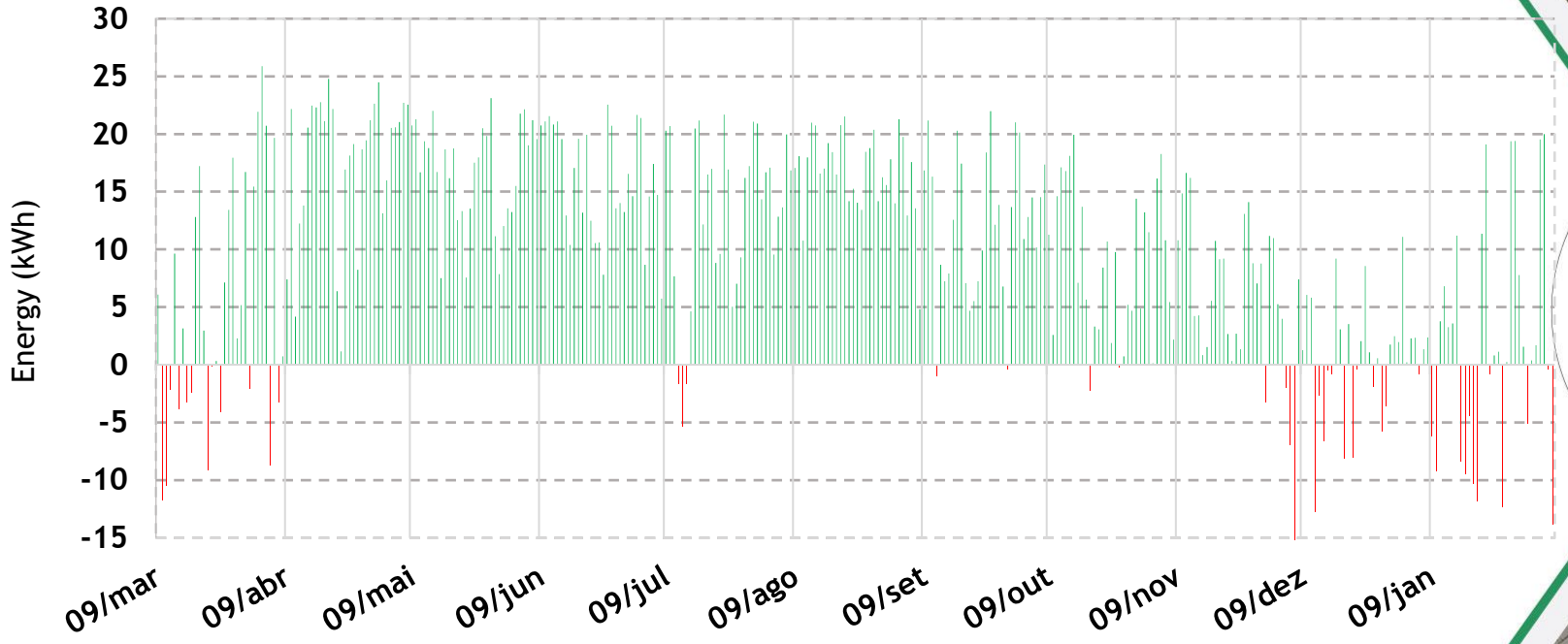
Annual profile
RES generation [2018/2023] LNEG's Pilot

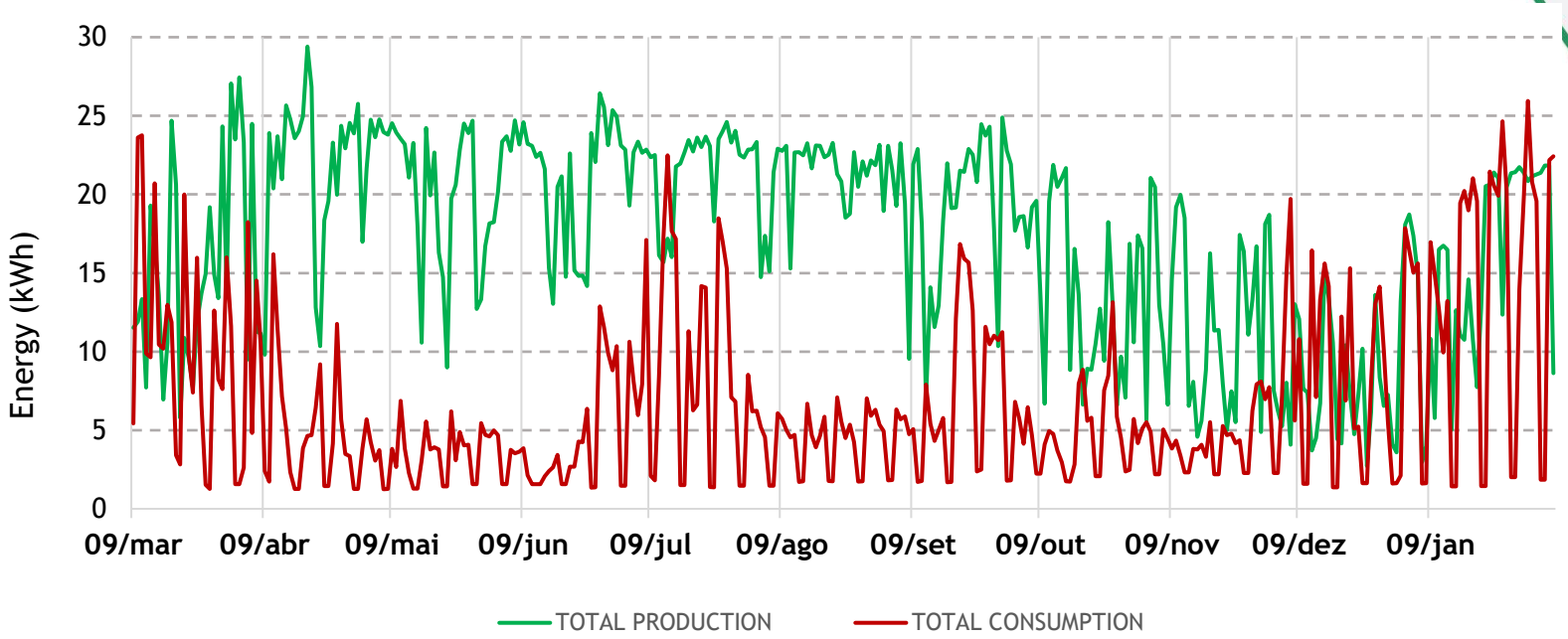




Electric energy production vs consumption
Daily surplus/shortage of energy (March 2022 to February 2023)



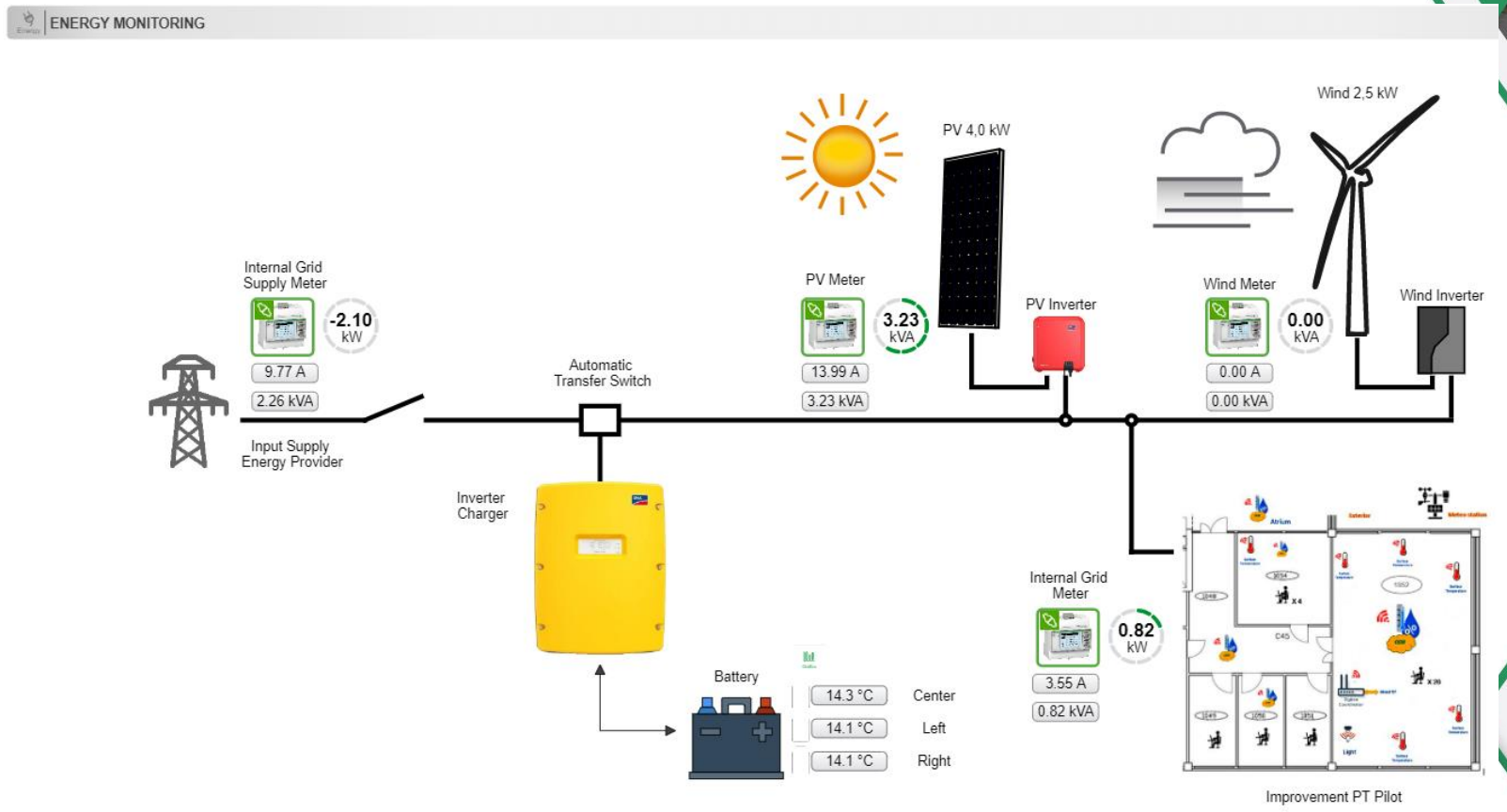
Production vs Consumption
(March 2022 to February 2023)



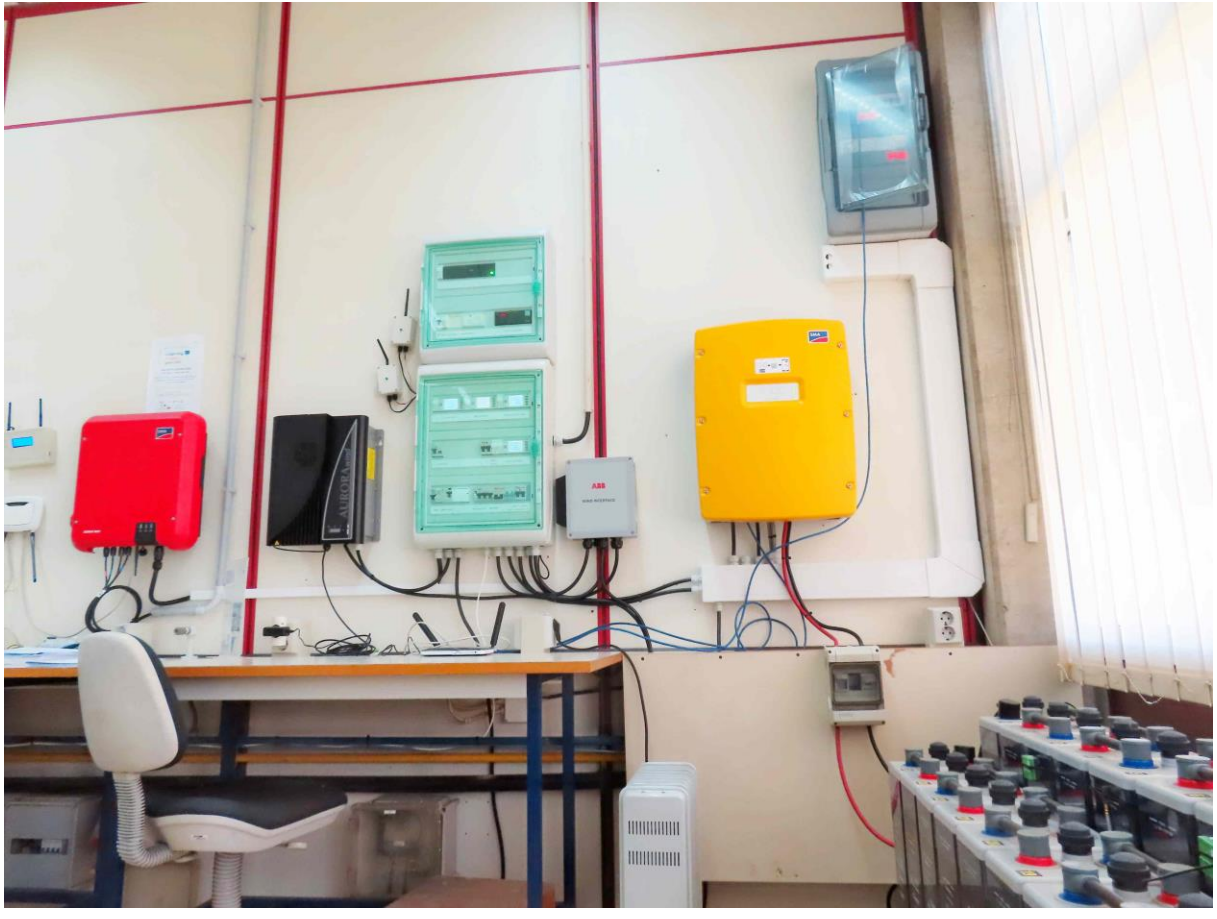
Average Daily	
Production	Consumption
17 kW	7 kW

Load Management at LNEG Pilot

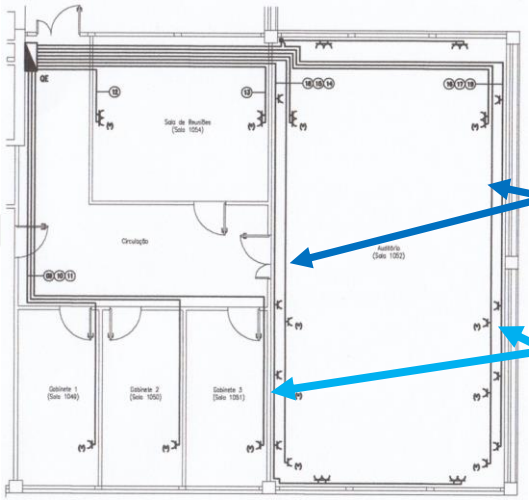
Microgrid parameters monitoring (web interface)



Microgrid and RES control area



Load Management System



::Priority::
Circuits that not be turned off
(Ex. Lights, office Schuck plugs)

::Non- Priority::
Circuits that can be turned off
(Extra Schuck plugs)

Synthesis

The specification and commissioning of LNEG's pilot monitoring and control system concluded successfully and included:

- the required parameters for building comfort assessment;

- all relevant quantities of the thermal system including, heat pump schedules and consumption, enthalpy meters, conditions of the heat/cold tank storages and the overall parameters requested for energy efficiency assessment;

- all power/energy relevant quantities for assessment of performance (and control) of a microgrid composed of PV solar panels, a micro wind turbine, batteries and controllable loads;

- specification/design of a new microgrid's power management system for automatic switching between the two modes of operation of the microgrid: grid-connected and isolated/stand-alone mode.

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