Control PV Plant with a PLC
(Energy gateway for renewables)

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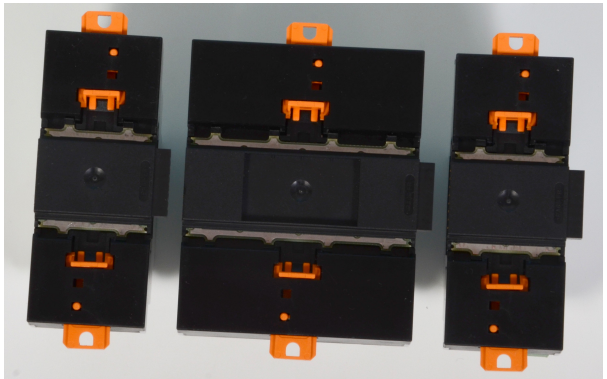
Product Features

- Unified PLC interface
- Power efficient
- Modular solution
- Embedded experience since 1997

CZECH PRODUCT

Monitoring of

- Inverters
- String Boxes
- Electricity Meters (AC, DC)
- Sensors (Irradiation, Temperature, Wind)
- Safety Relays
- Door Contact (Theft Protection)
- Overvoltage (Lightning Protection)



Why this gateway is useful?

- Technological criteria
- Fast implementation
- Costs reduction
- Postpone energy consumption
- Weather forecast
- Systems interaction
- Dependancy on price levels, stock market prices
- Conditions for connection a PV plant to the grid

Which manufacturers are supported?

What Are the Solar Monitor Solution Areas?

Software Interface Overview

XML

SOAP

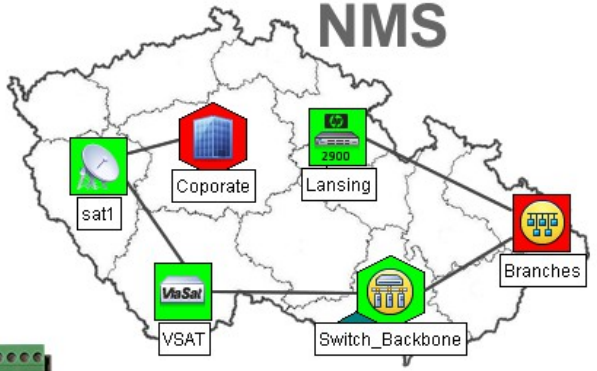
SNMP

Modbus

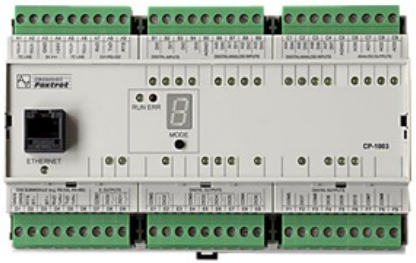
SUNSPEC ALLIANCE

Cloud

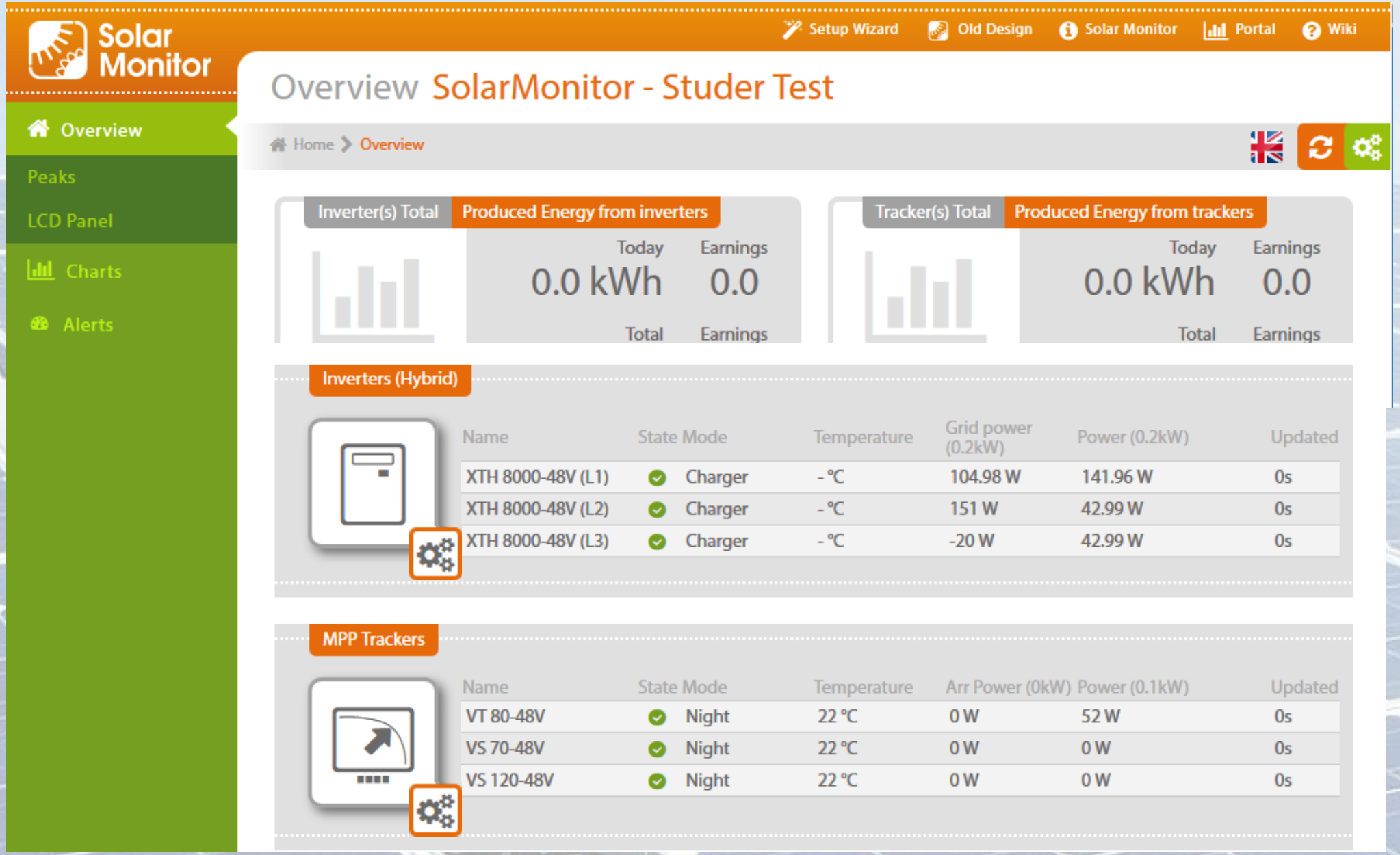
NMS



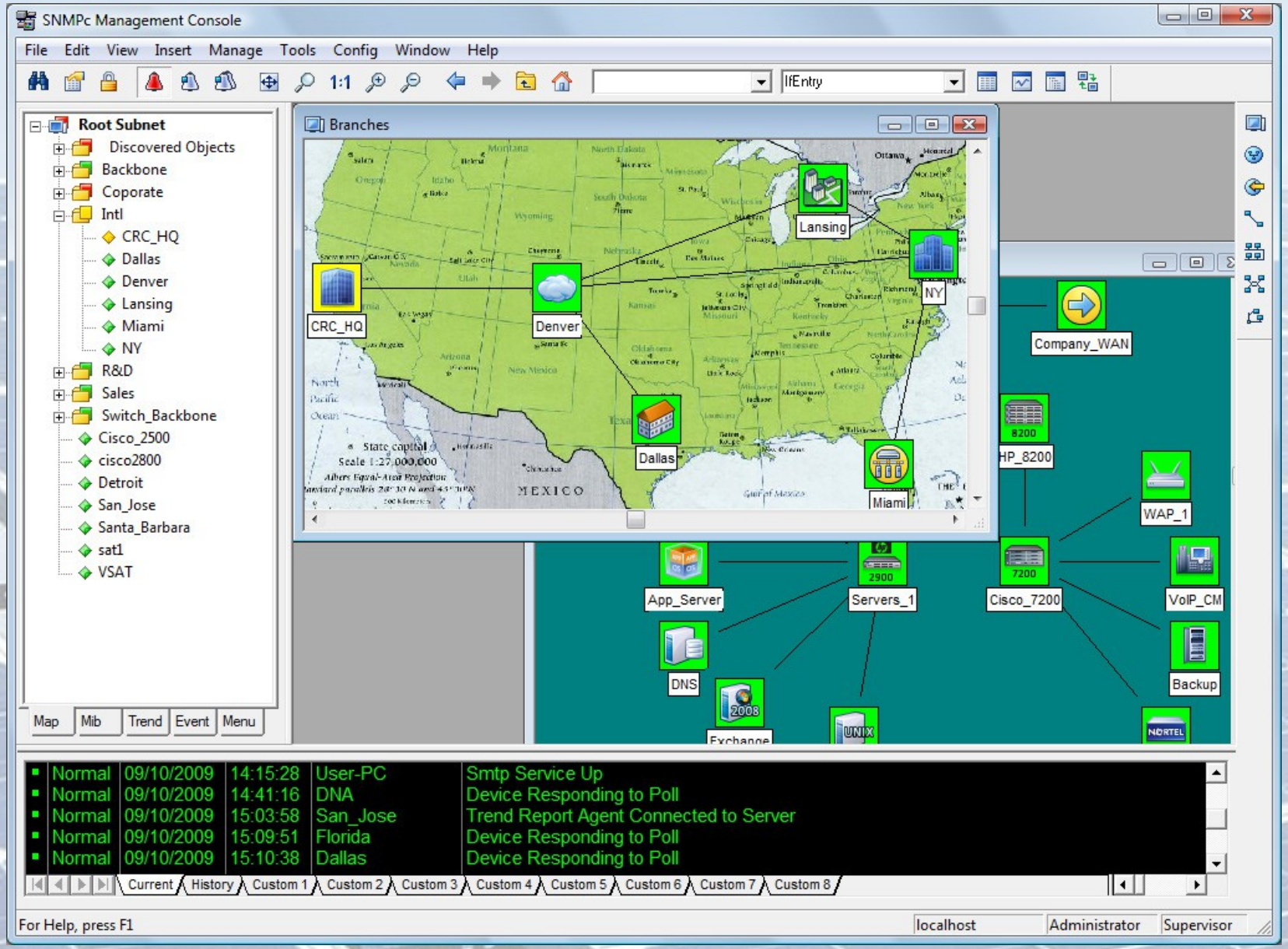
PLC



Webserver of the SM2-MU: Responsive Design

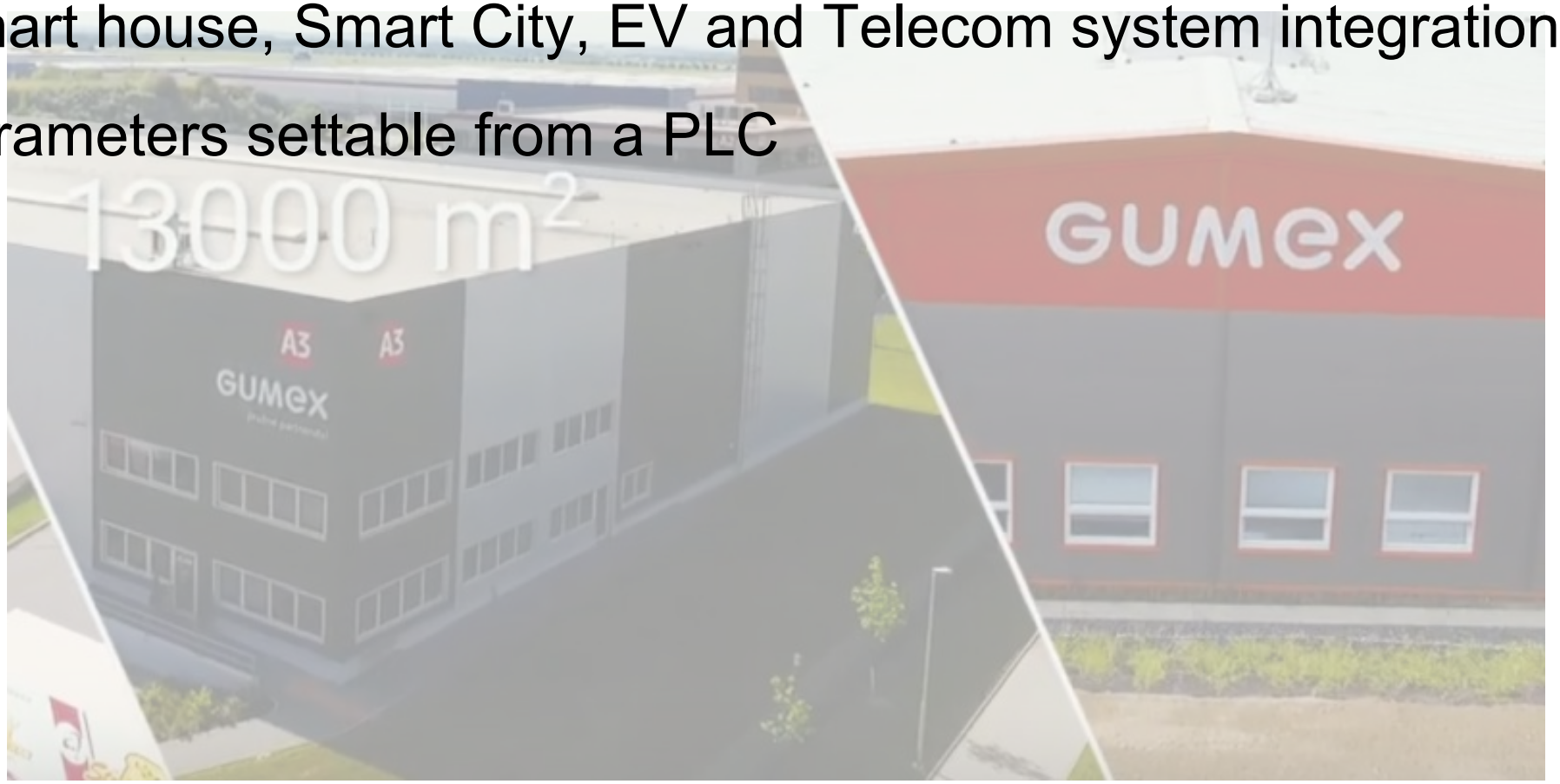


SNMP – Castlerock SNMPc: Geographical Maps

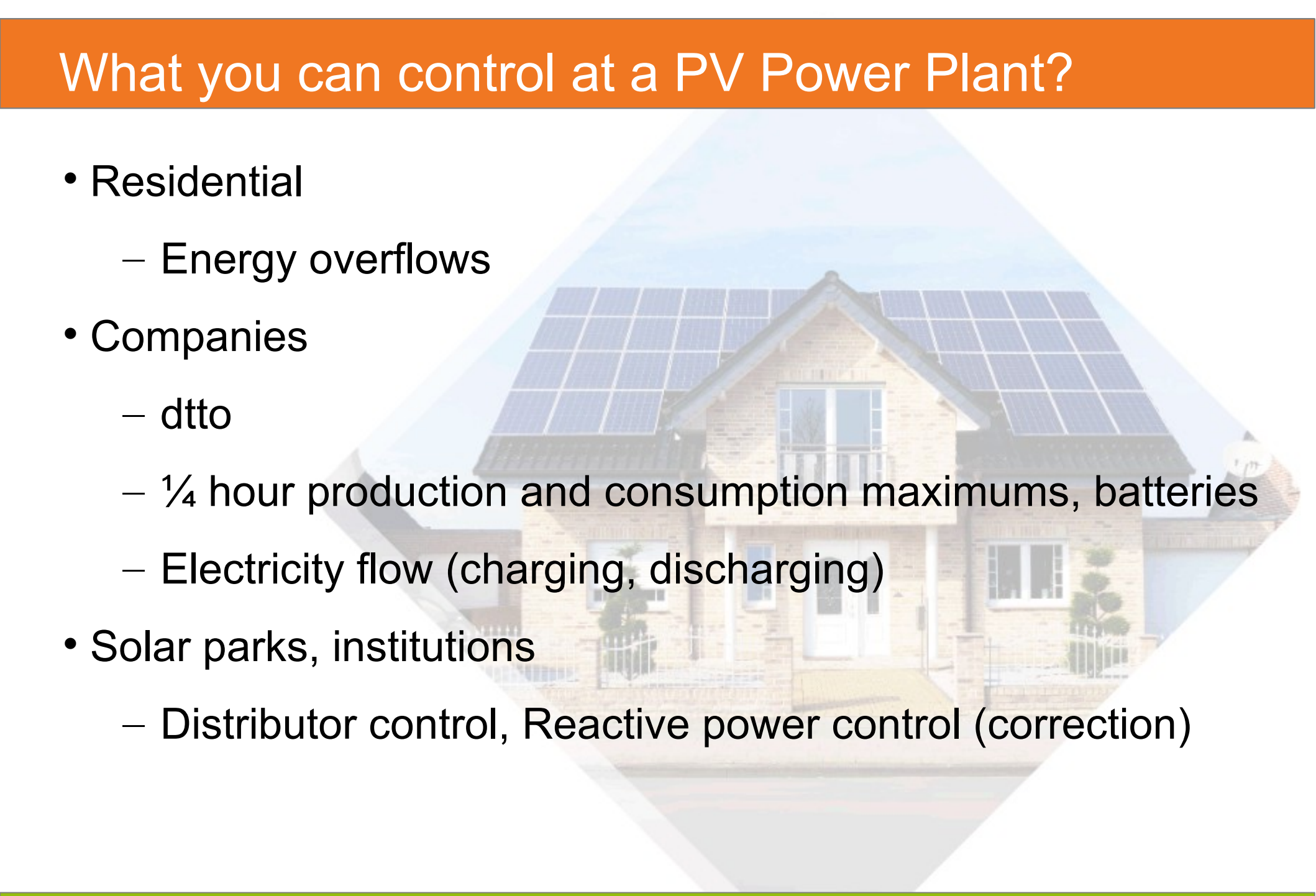


What we automate at a power plant?

- Power control – active & reactive, fluent regulation
- Obtaining data from devices with proprietary protocols
- Smart house, Smart City, EV and Telecom system integration
- Parameters settable from a PLC



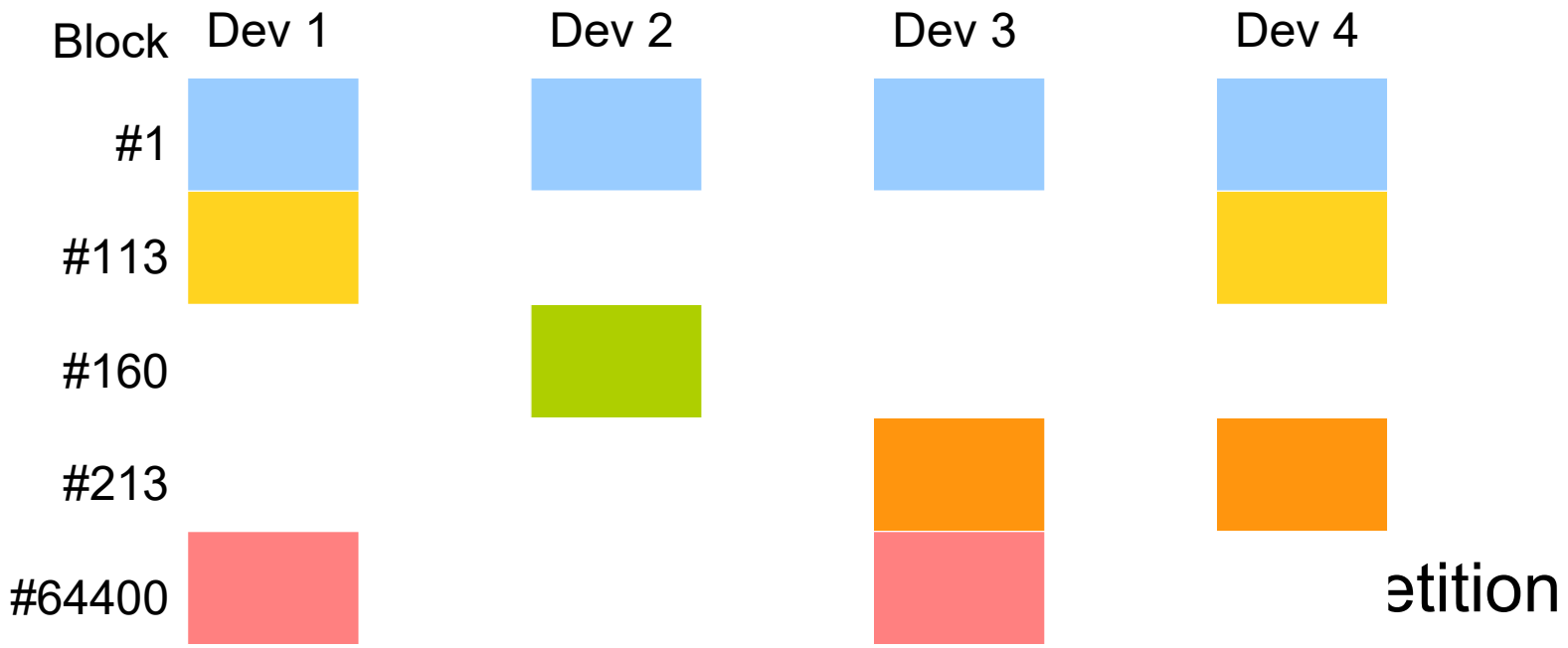
What you can control at a PV Power Plant?



- Residential
  - Energy overflows
- Companies
  - dtto
  - ¼ hour production and consumption maximums, batteries
  - Electricity flow (charging, discharging)
- Solar parks, institutions
  - Distributor control, Reactive power control (correction)

What makes our solution unique?

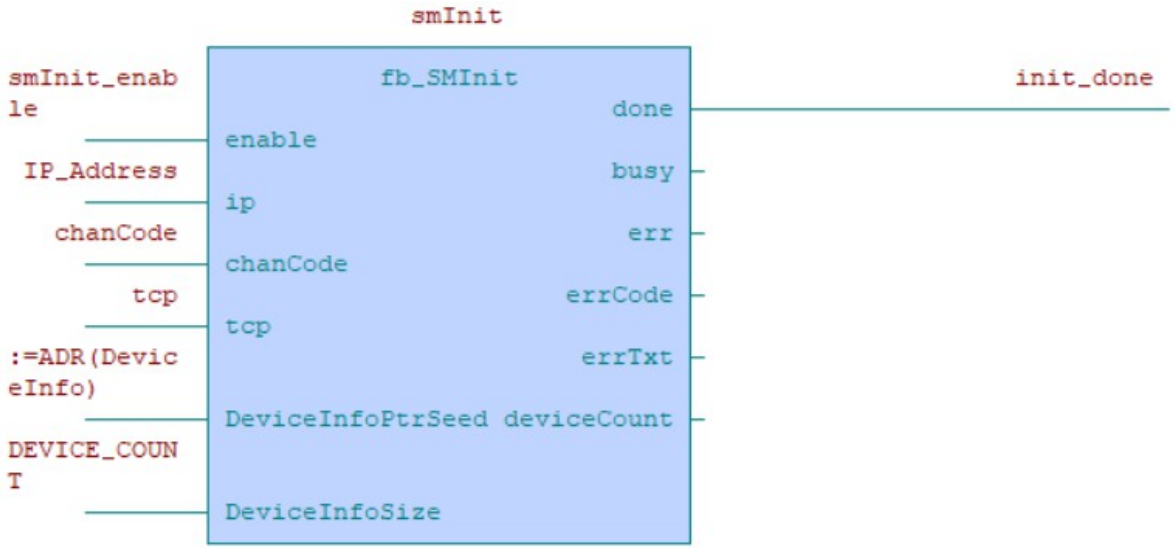
- Universal and custom blocks in the SM2-MU



- Forward and backward both device and SW compatibility
- Communication with "not yet existing devices"

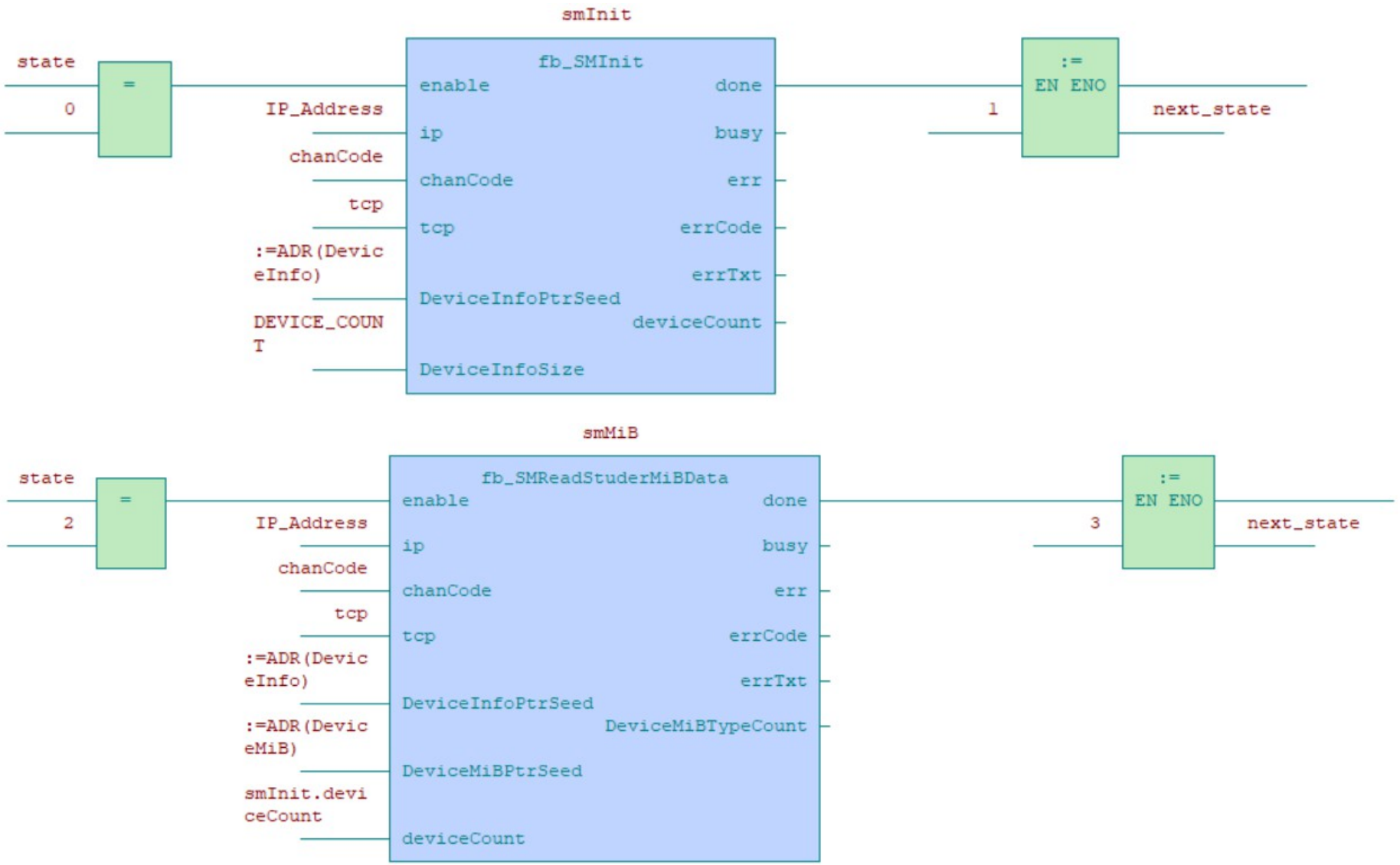
How do we achieve easy and fast implementation?

- Modbus variables organized in blocks (Sunspec)
- PLC library



- E.g.: Existing installation with 3 inverters from one manufacturer, 1 device breaks down, replaced with another one, no change in communication, neither in management

PLC Example in IEC 61131-3 FBD: Data Reading



PLC Example in IEC 61131-3 ST: Data Reading

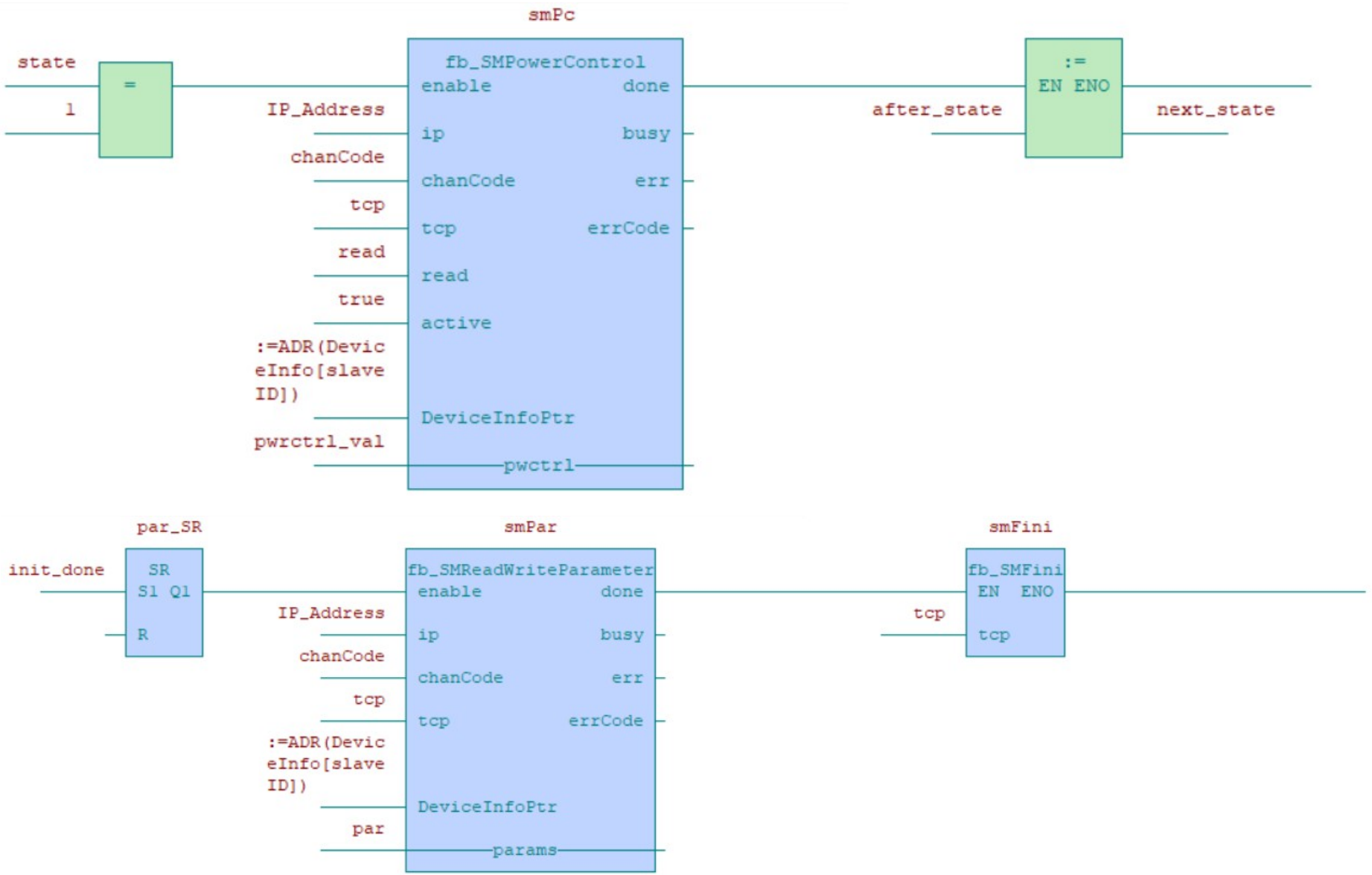
```
PROGRAM prgMain
  VAR_INPUT
  END_VAR
  VAR_OUTPUT
  END_VAR
  VAR
        enable : BOOL := 1;
        ip : STRING := '192.168.1.221:502';
        chanCode : UINT := ETH1_uni0;
        tcp : BOOL := TRUE;
        sm : fb_Solarmonitor10;

  END_VAR
  VAR_TEMP
  END_VAR

    sm(enable := enable, ip := ip, chanCode := chanCode, tcp := tcp);

END_PROGRAM
```

PLC Example in IEC 61131-3 FBD: Power Control



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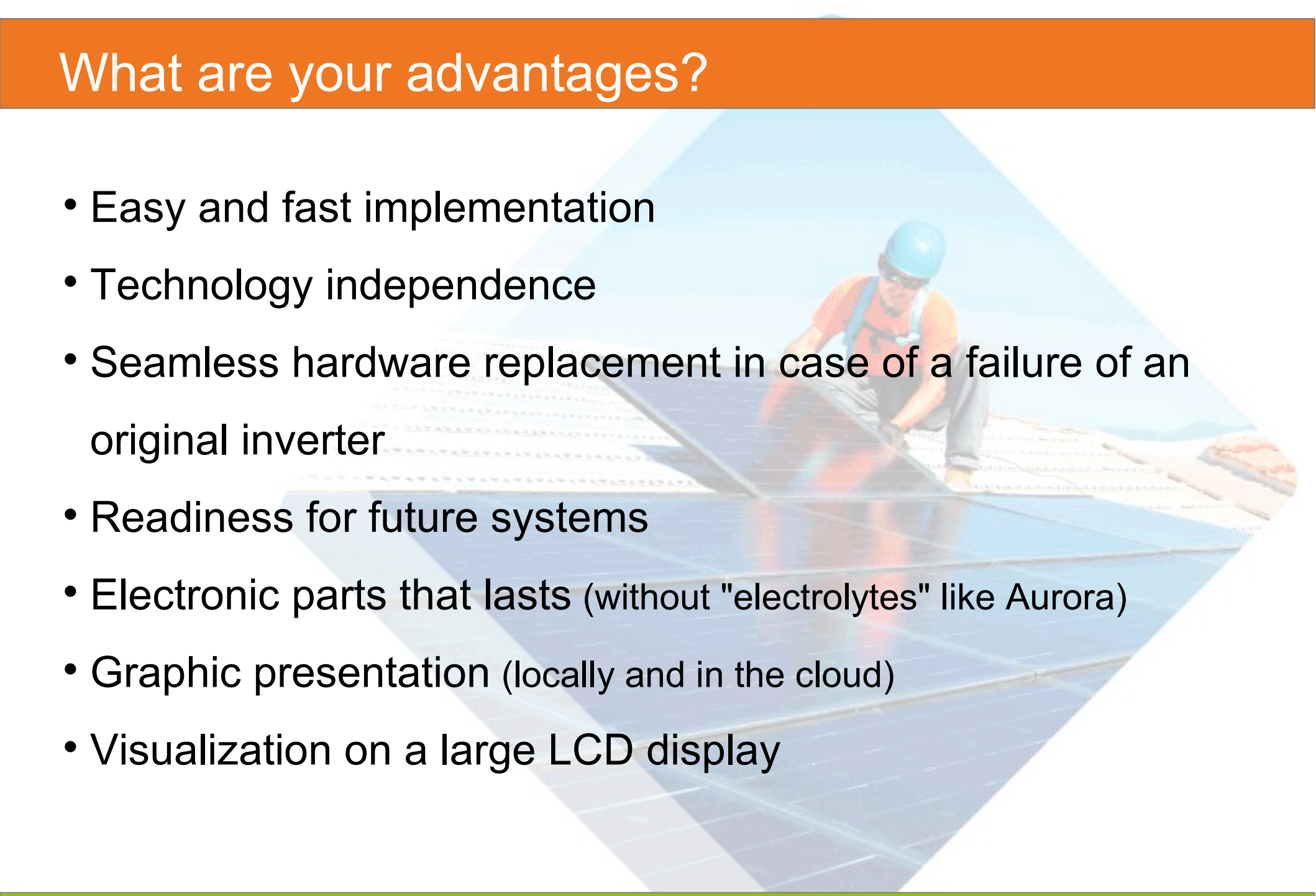
PLC Example in IEC 61131-3 ST: Power Control

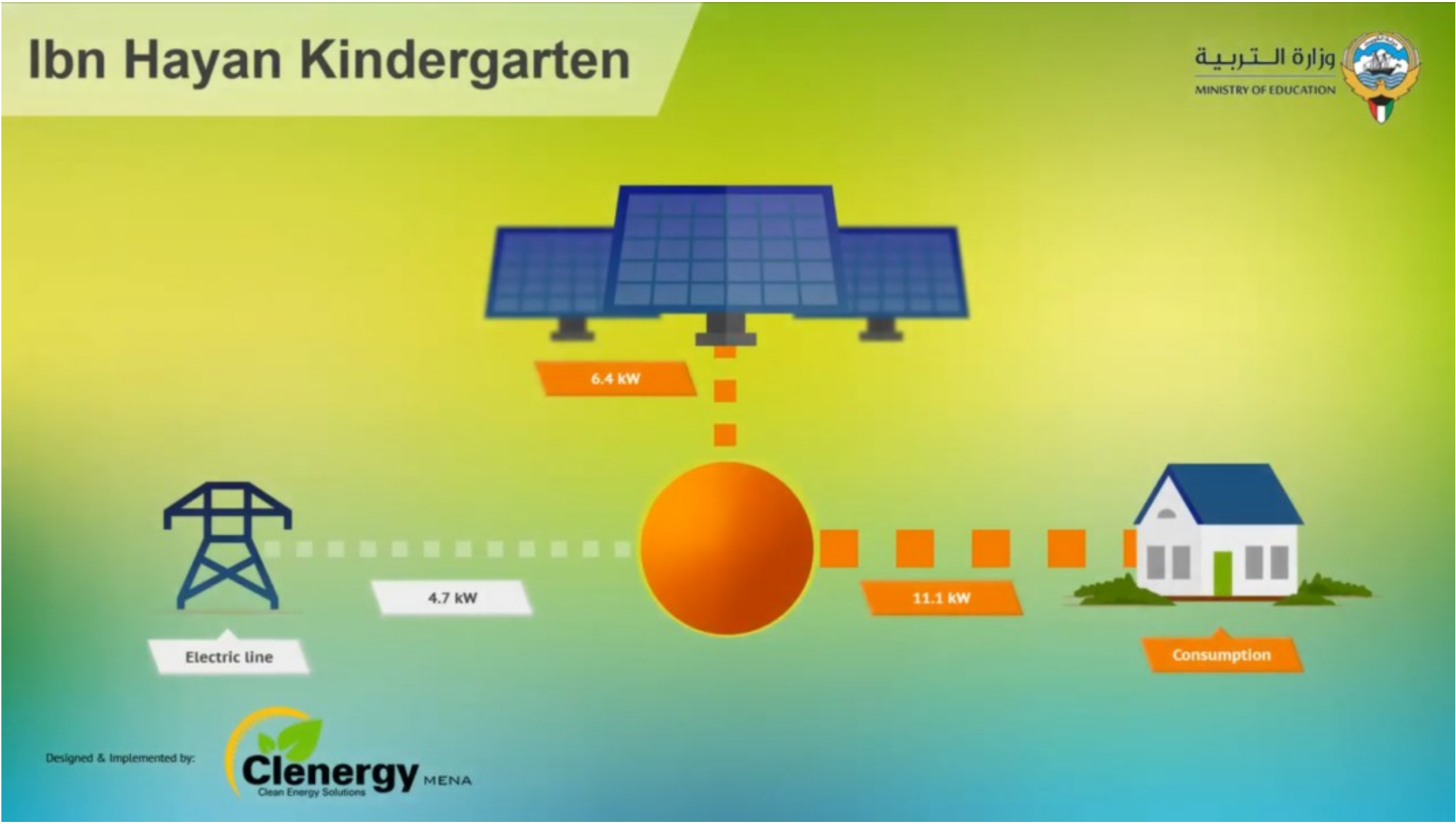
```
PROGRAM prgMain
  VAR_INPUT
  END_VAR
  VAR_OUTPUT
  END_VAR
  VAR
        enable : BOOL := 1;
        unitID : USINT := 5;
        sm_pc : fb_PowerControl30;
        ip : STRING := '192.168.1.221:502';
        chanCode : UINT := ETH1_uni0;
        tcp : BOOL := TRUE;
        val : UINT := 60;
        active : BOOL := TRUE;

  END_VAR
  VAR_TEMP
  END_VAR

    sm_pc(enable := enable, ip := ip, unitID := unitID, chanCode :=
chanCode, tcp := tcp, pwctrl := val, active := active);

END_PROGRAM
```

What are your advantages?



- Easy and fast implementation
- Technology independence
- Seamless hardware replacement in case of a failure of an original inverter
- Readiness for future systems
- Electronic parts that lasts (without "electrolytes" like Aurora)
- Graphic presentation (locally and in the cloud)
- Visualization on a large LCD display

LCD Visualization Example (see our Youtube channel)



Dashboard Example: normal, no consumption during day

Od 04.07.2018 Do 04.07.2018 dnes listopad 2018

Dashboard

Solar Production

Max: 2.94 [kW]
Energy: 23.69 [kWh]

Consumption

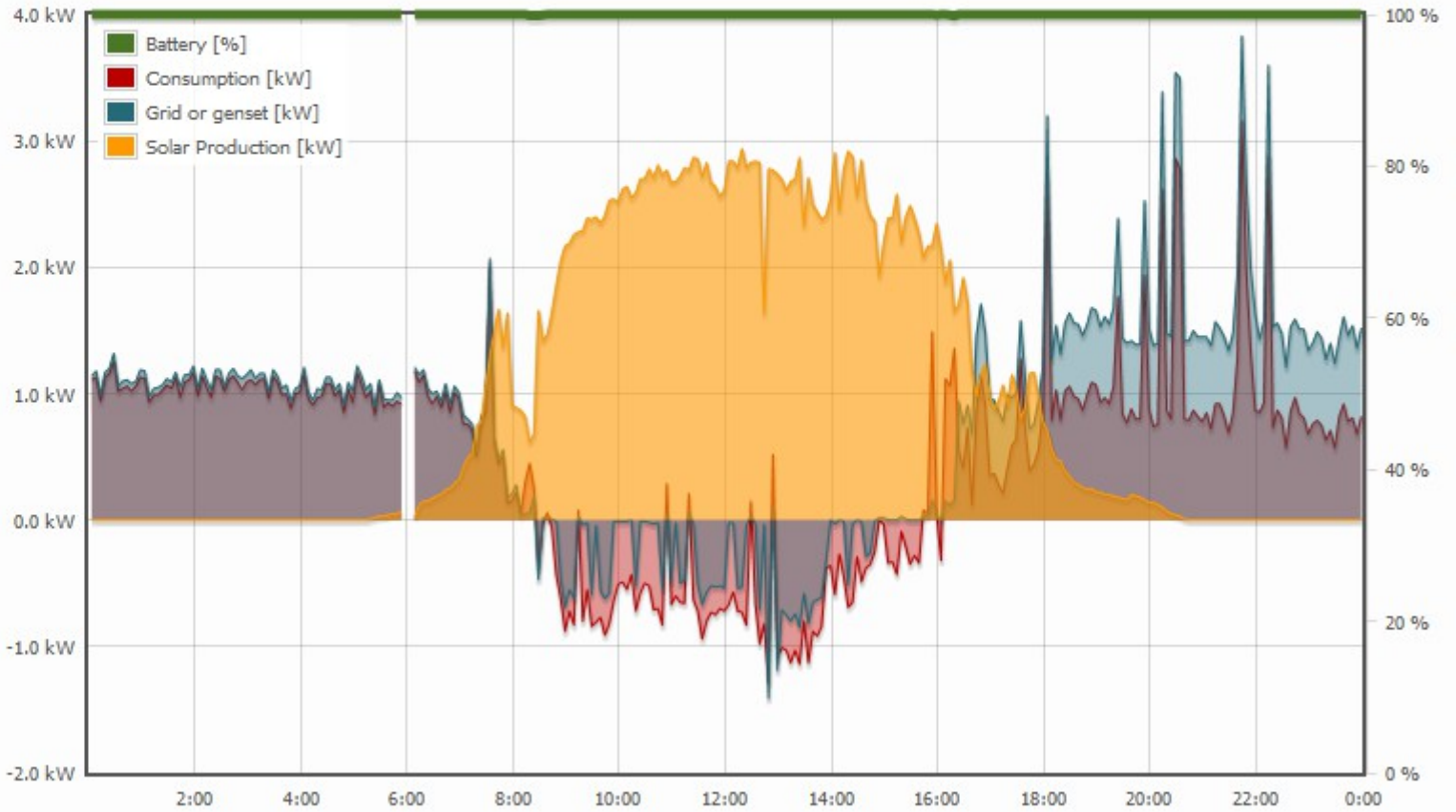
Max: 3.16 [kW]
Energy: 11.33 [kWh]

Grid or genset

Max: 3.83 [kW]
Energy: 18.13 [kWh]

Battery SOC

Max: 100.00 [%]
Min: 99.81 [%]



Graph Example: normal, consumption during day

Od 30.07.2018 Do 30.07.2018 dnes listopad 2018

Dashboard

Solar Production

Max: 3.00 [kW]
Energy: 25.23 [kWh]

Consumption

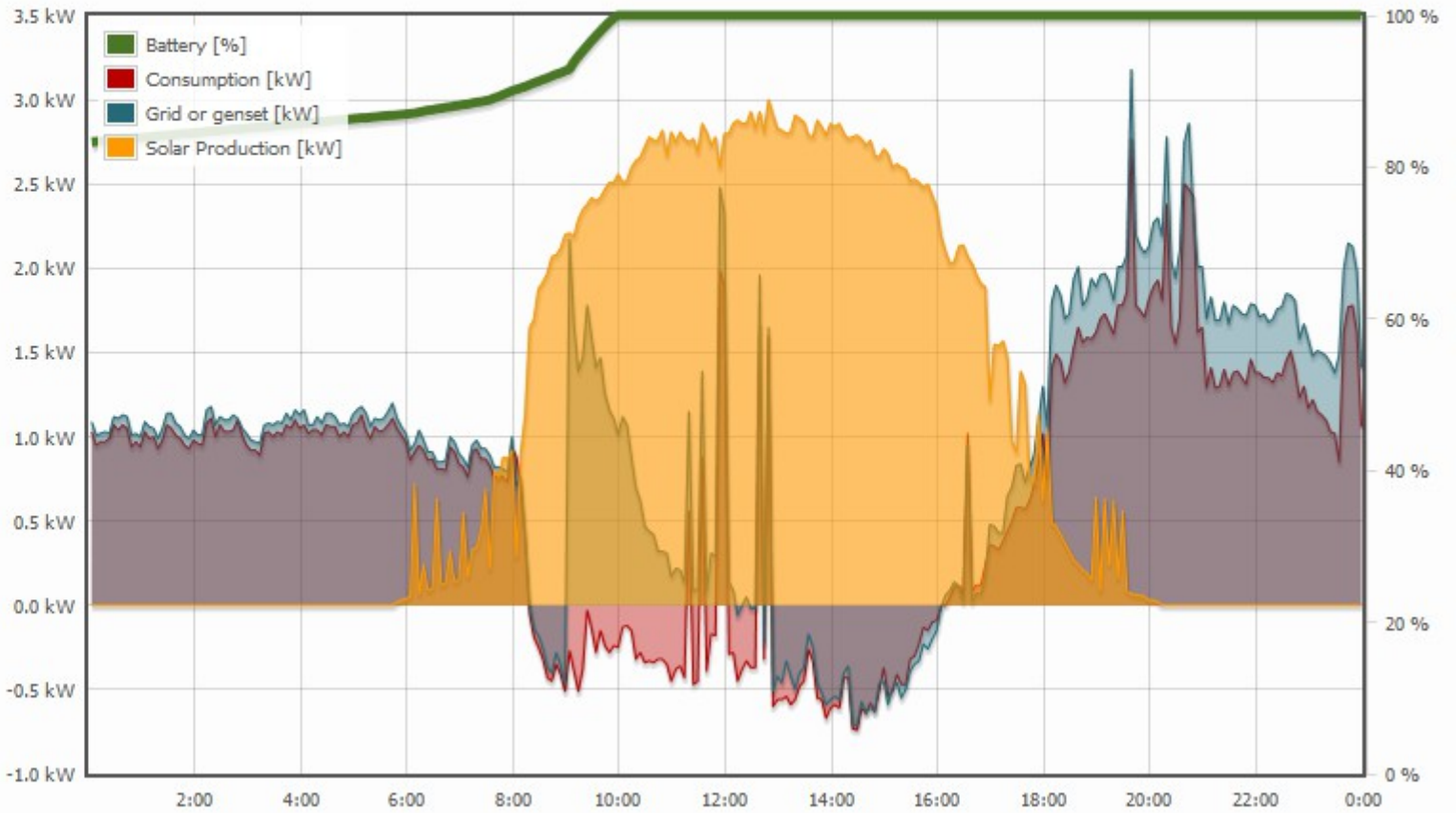
Max: 2.77 [kW]
Energy: 16.04 [kWh]

Grid or genset

Max: 3.18 [kW]
Energy: 22.24 [kWh]

Battery SOC

Max: 100.00 [%]
Min: 83.31 [%]



Graph Example: increasing consumption = ?

Od 27.08.2018 Do 27.08.2018 dnes listopad 2018

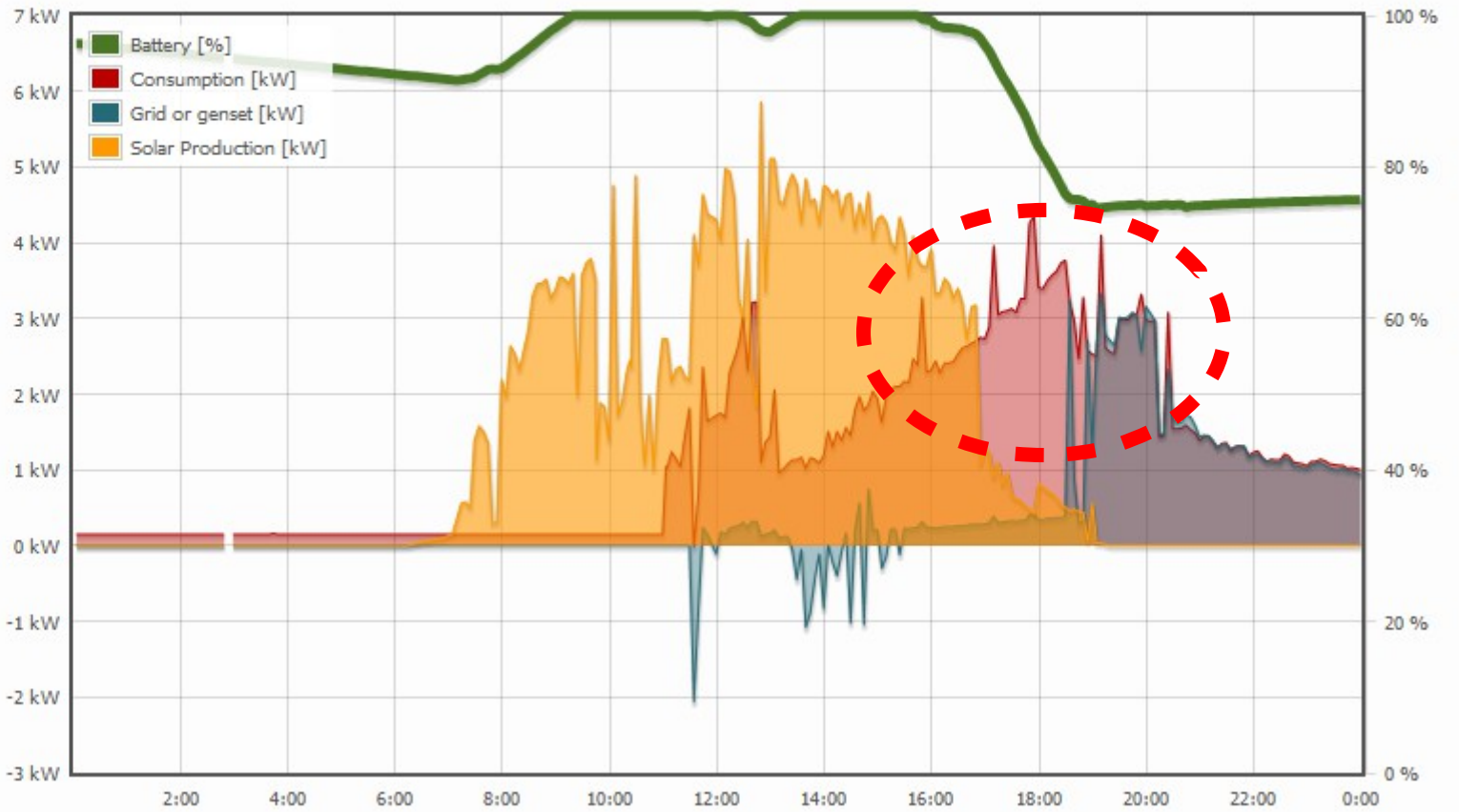
Dashboard

Solar Production
Max: 5.86 [kW]
Energy: 33.14 [kWh]

Consumption
Max: 4.35 [kW]
Energy: 28.23 [kWh]

Grid or genset
Max: 3.33 [kW]
Energy: 9.62 [kWh]

Battery SOC
Max: 100.00 [%]
Min: 74.56 [%]



Graph Example: afternoon consumption discharges battery

Od 28.07.2018 Do 28.07.2018 dnes listopad 2018

Dashboard

Solar Production

Max: 3.34 [kW]
Energy: 13.23 [kWh]

Consumption

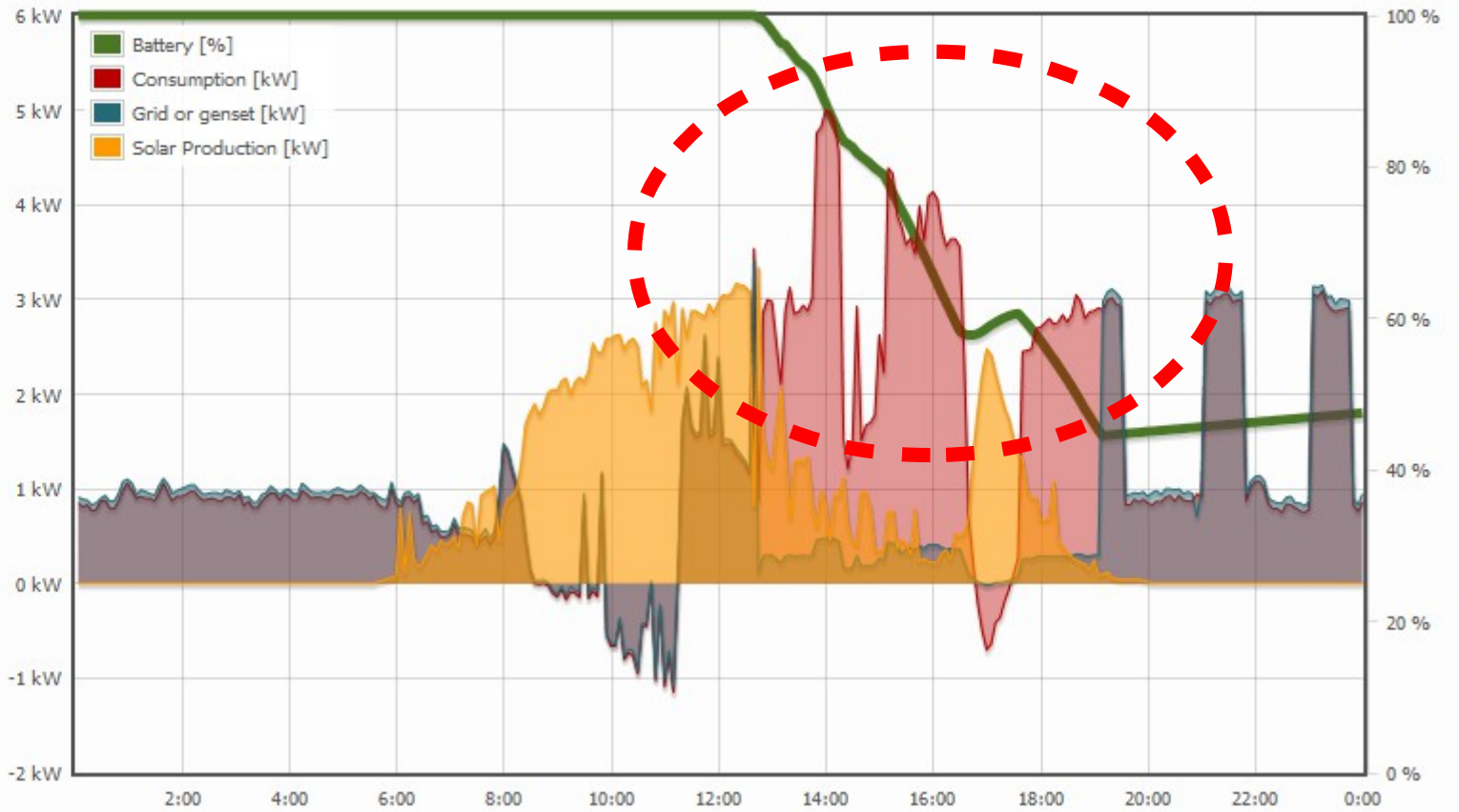
Max: 5.00 [kW]
Energy: 25.97 [kWh]

Grid or genset

Max: 3.42 [kW]
Energy: 11.88 [kWh]

Battery SOC

Max: 100.00 [%]
Min: 44.50 [%]



Graph Example: evening consumption, night peaks

Od 30.08.2018 Do 30.08.2018 dnes listopad 2018

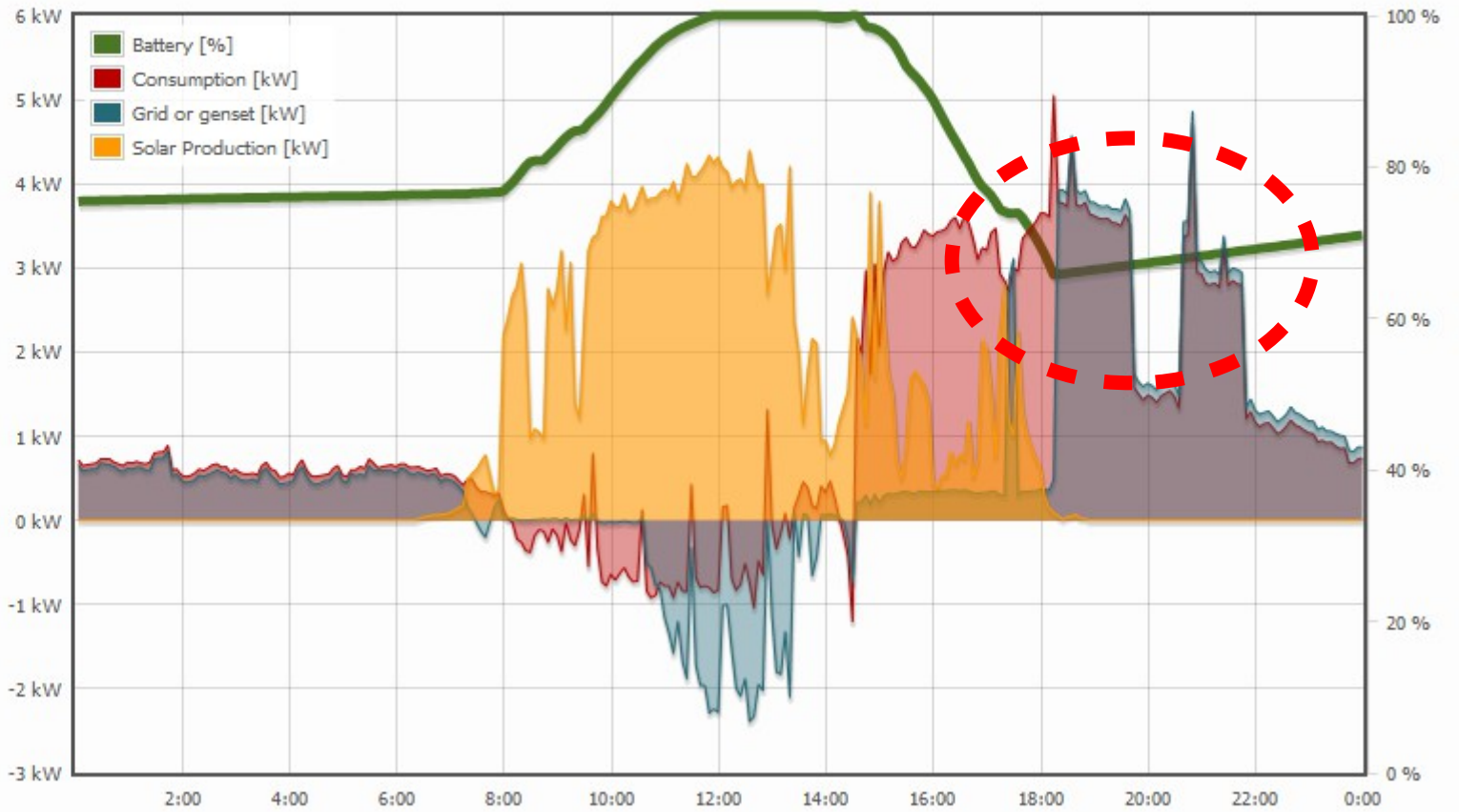
Dashboard

Solar Production
Max: 4.40 [kW]
Energy: 25.54 [kWh]

Consumption
Max: 5.05 [kW]
Energy: 27.15 [kWh]

Grid or genset
Max: 4.86 [kW]
Energy: 14.68 [kWh]

Battery SOC
Max: 100.00 [%]
Min: 65.75 [%]



Graph Example: same situation + next day (charging)

Od 30.08.2018 Do 31.08.2018 dnes listopad 2018

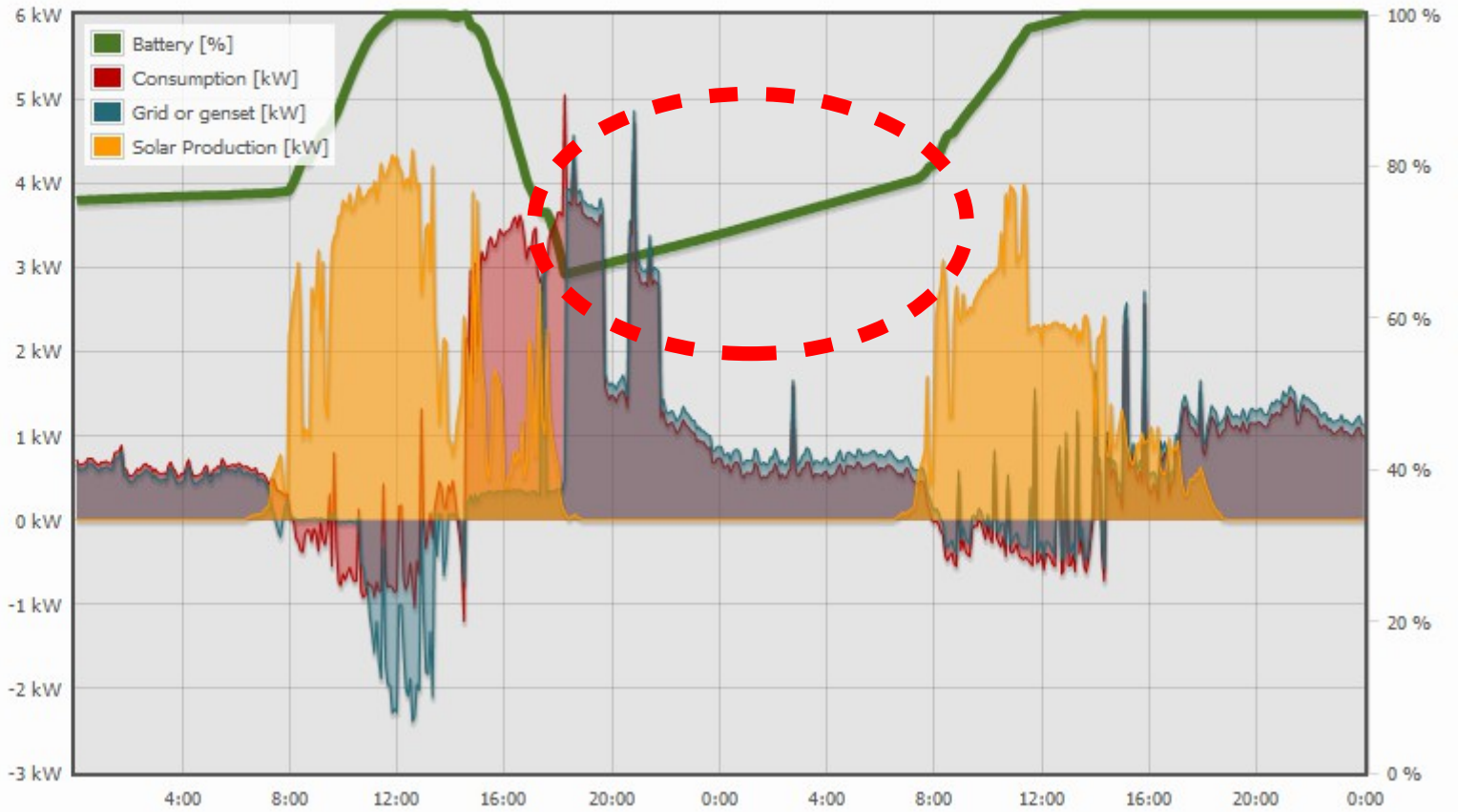
Dashboard

Solar Production
Max: 4.40 [kW]
Energy: 45.60 [kWh]

Consumption
Max: 5.05 [kW]
Energy: 40.26 [kWh]

Grid or genset
Max: 4.86 [kW]
Energy: 31.26 [kWh]

Battery SOC
Max: 100.00 [%]
Min: 65.75 [%]



Any questions are welcome!

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