Energy Gateway for Renewables

Monitoring, Control & Maintenance

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Solar Monitor s.r.o.
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Solar Monitor – Company History

- 1997 – start with embedded systems
- 2004 – Embedded Technologies s.r.o.
- 2009 – Solar Monitor v1
- 2011 – Solar Monitor v2
- 2012 – Solar Monitor s.r.o.
- 2014 – PRE a.s.
- 2016 – ČEZ Solární s.r.o.,
  Studer-Innotec SA,
  Steca Elektronik Gmbh

Solar Monitor – Solution Areas

Software Interface Overview

XML

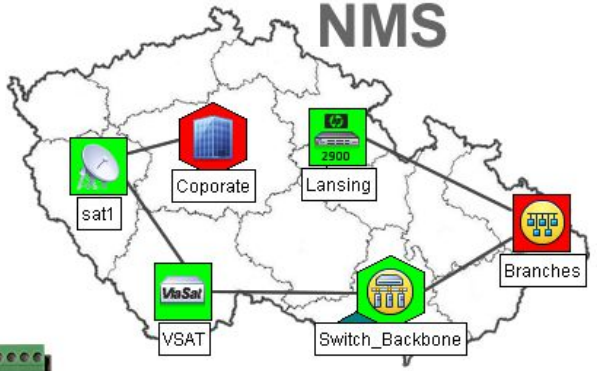
SOAP

SNMP

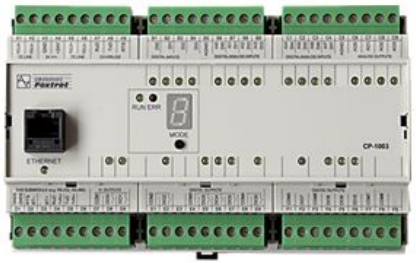
Modbus

Cloud

NMS



PLC



Solution Examples

- Initial system setup and tuning
- Maintenance & support (mix of inverter types)
- LCD display visualization
- Detailed visualization of energy system
  animated icons – Controlweb, Regulus, Reliance
- Energy gateway for PLCs (Modbus)
  automation, smart houses
- Gateway for Network Management Systems (SNMP)
  (NMS) Telecommunications
- Data source for web service oriented servers

Design Highlights

- Low power consumption (1.2 W)
- No electrolytic capacitors (long lifetime)
- DIN rail format
- Coupling with DIN rail bus requires no wires
- Modular system to suit user applications at minimal cost
- Fast pulse counters
- Own design (other custom modules can be developed)

Software Highlights

- Unused software does not consume any power
- Loadable software modules
- Solution extensibility
- Cloud architecture also for
  - power consumption tracking
  - sensor logging
  - storing of periodic (historical) PLC data
- Back channel for device maintenance w/o fixed IP address
- Own design (implementation of new functionalities)

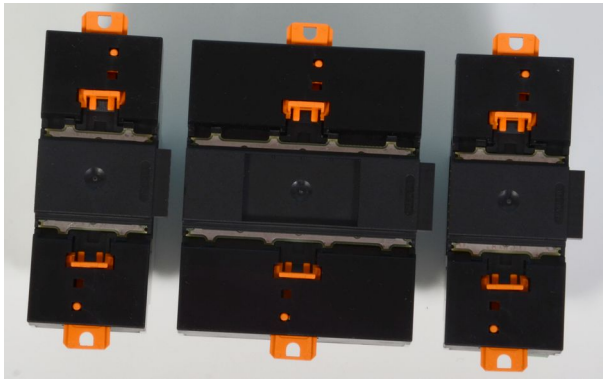
Product Components

Modular solution

Cost effective sensors

Monitoring of

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



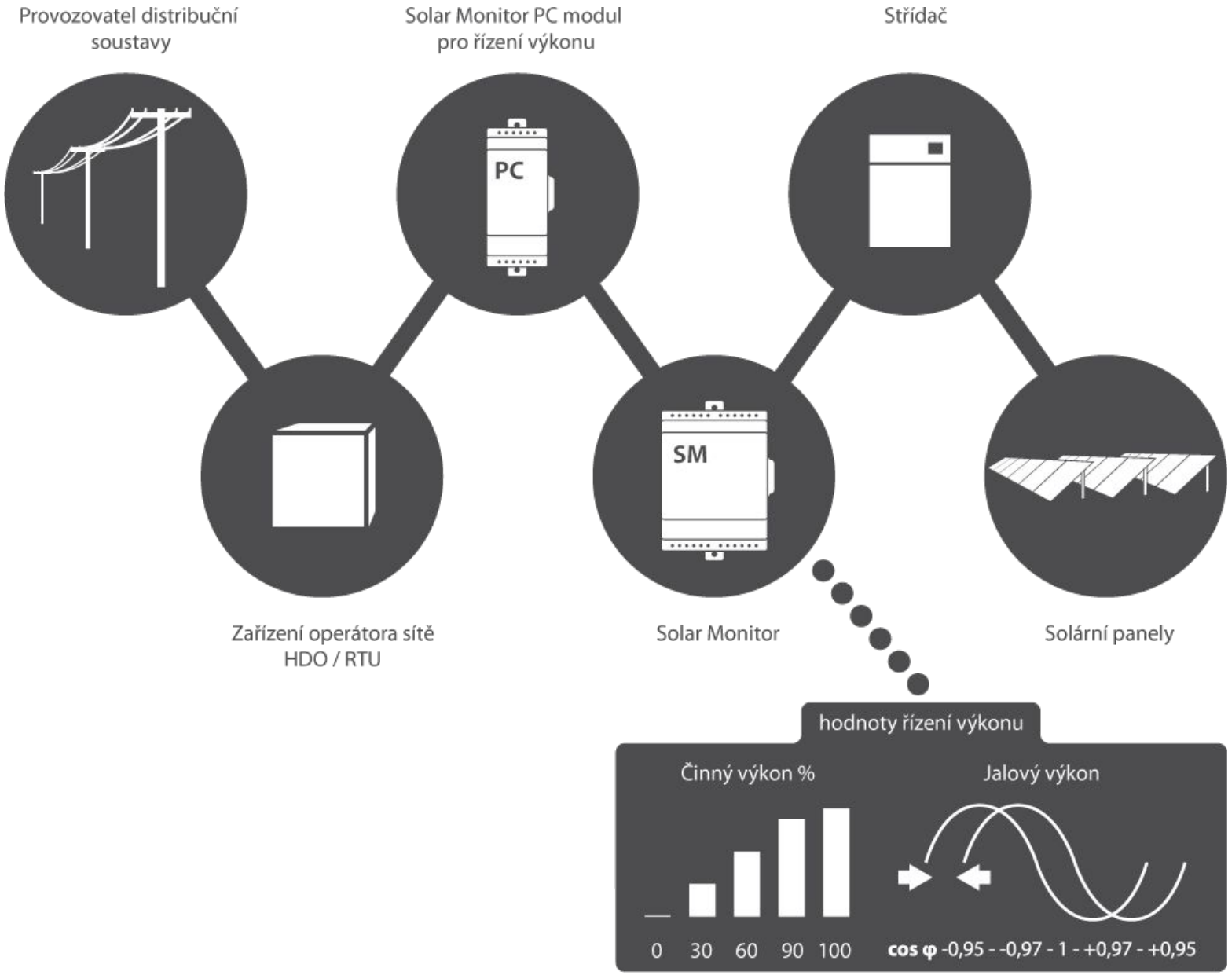
Supported Devices

Solar Parks

Monitoring of

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

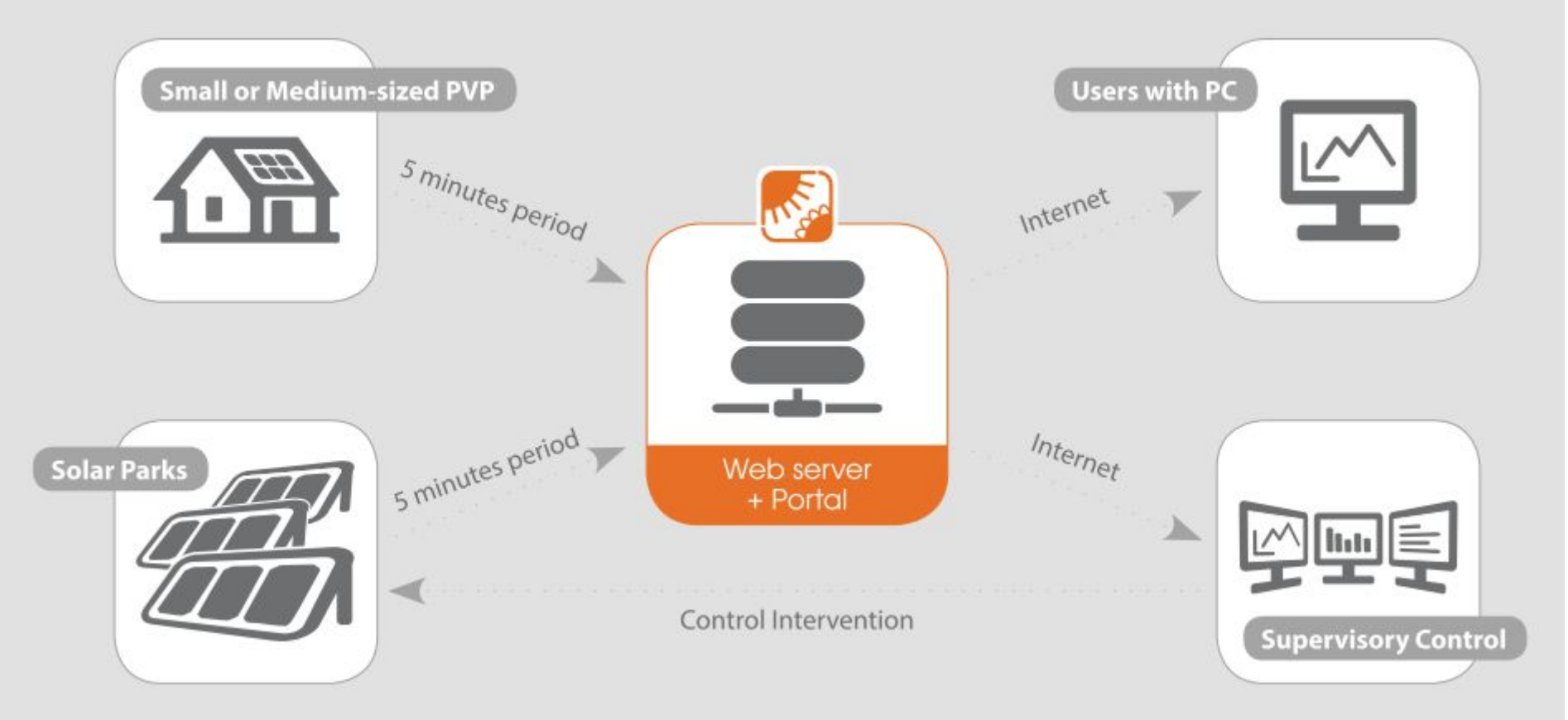
Power Control



Solar Monitor

Monitoring PV Plant

Remote Monitoring & Web Portal



Compatible with SMA SUNNY WEBBOX

Compatible with SolarMax SWISS QUALITY Max Web

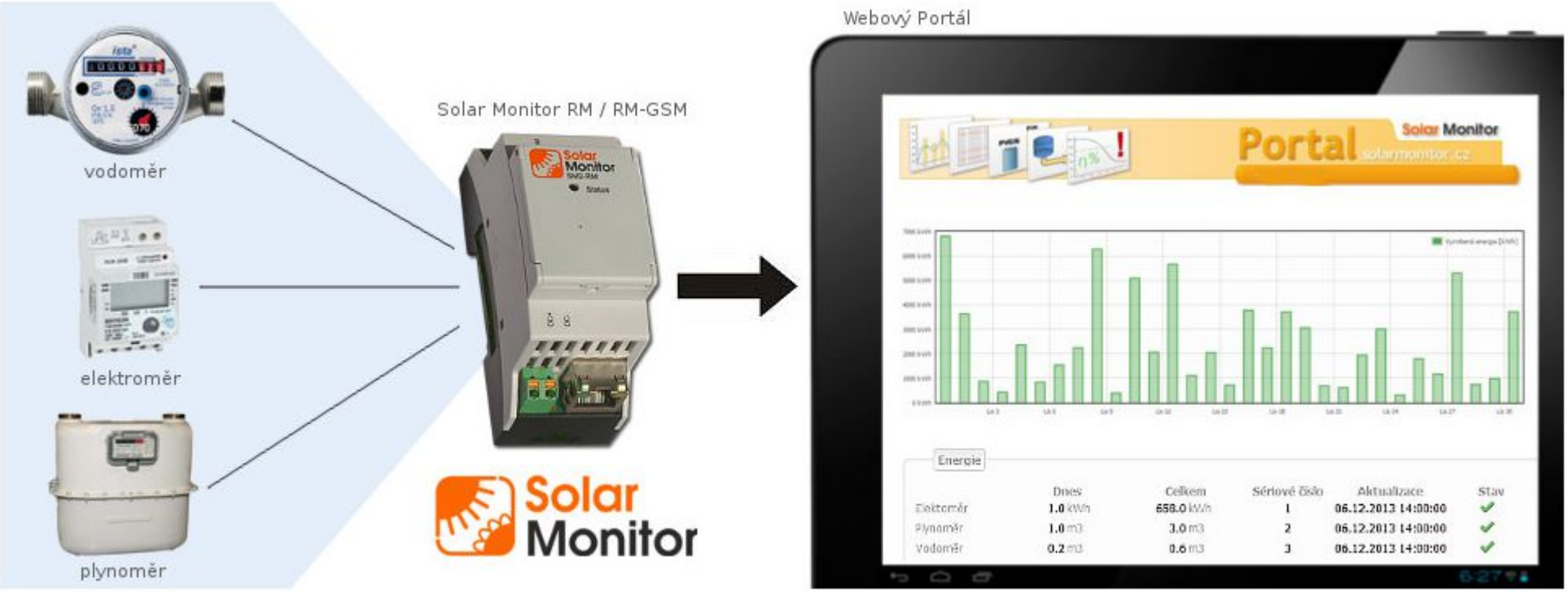
Smartphone Application

- comfortable remote PV plant monitoring via smartphone or tablet
- monitoring current energy production
- monitoring data from sensors and other connected devices
- notification of alarms (inverter, batteries, trackers, etc.)
- diagnosis with all the available values from the device
- production data in figures and clearly arranged graphs

Online Meter Reading

You can control your PV plant's production, energy consumption, water and gas consumption. The latest Solar Monitor product together with the web portal makes remote monitoring very easy and comprehensible.

Remote reading via Solar Monitor system is available for any devices with pulse output S0. In particular electro, water and gas meters.



LCD Visualisation

Visualisation of the PV plant on LCD panel is very popular solution of presenting technologies to schools, offices or municipal authorities. Layout is designed according to customers requirements.

We deliver to you

LCD screen of required dimensions

Datalogger

Smart Houses

Solar Monitor cooperates with several information systems which allows to process data from PV plants. These are e.g. Dispatcher Control Systems but mainly Home Automation Systems that can thus integrate any photovoltaic inverter from established manufacturers into smart house installation.

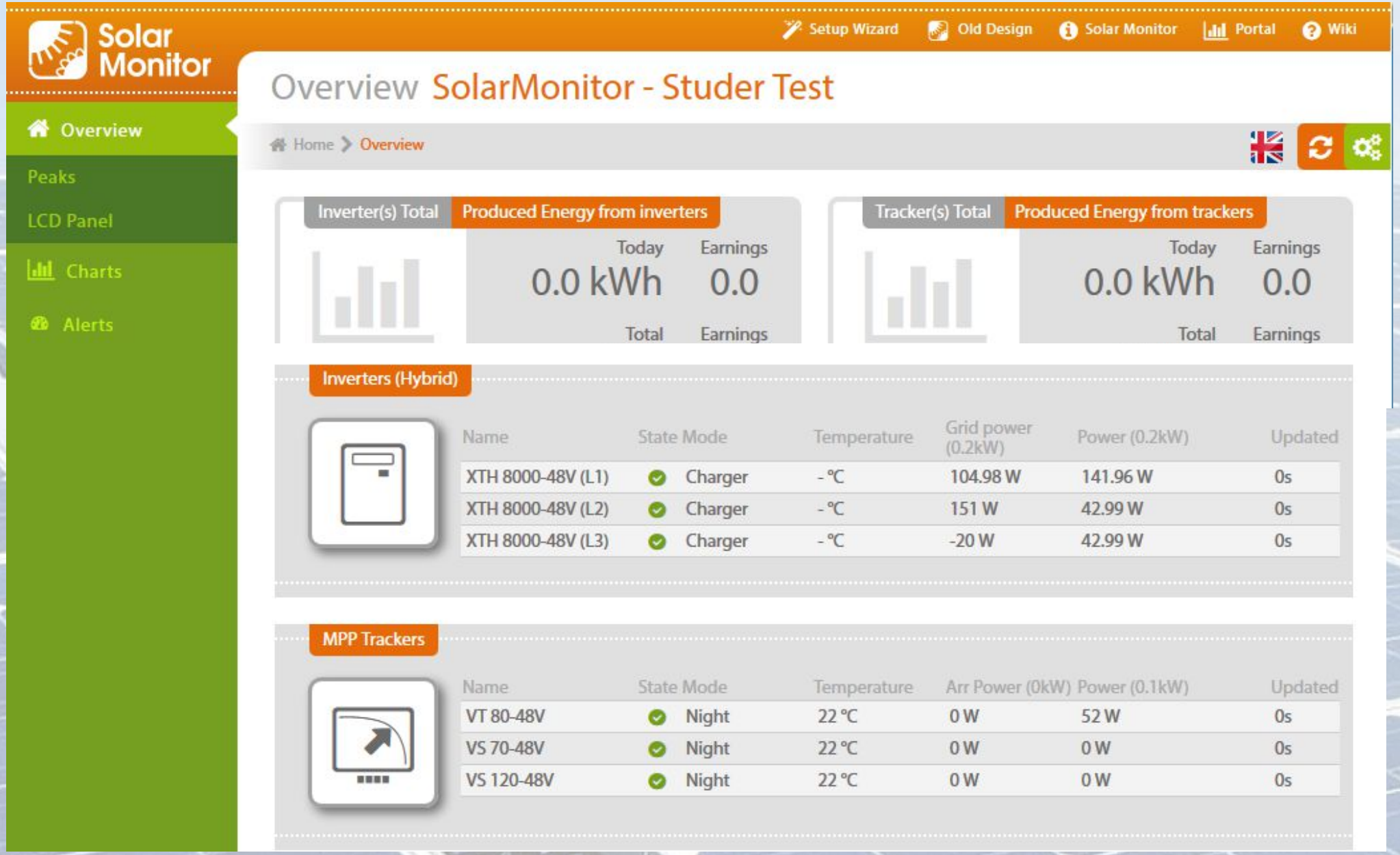
M2M

In November 2013 TECO company launched library SolarMonitorLib, that significantly increases Foxtrot PLC's ability to integrate PV plants into their Inteligent Houses.

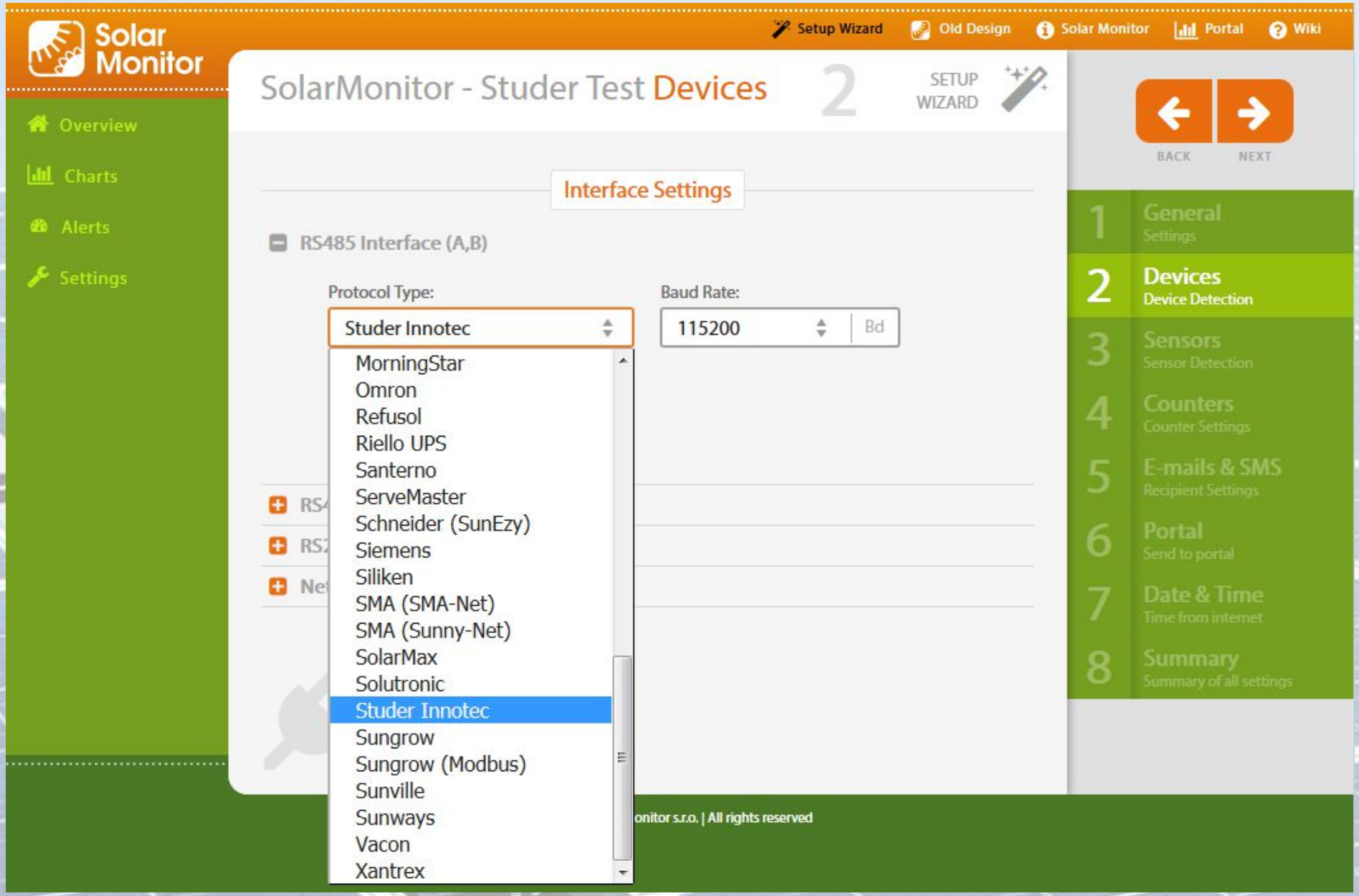
Advantages, Highlights (LAN)

- Support for Studer-Innotec products
- Ease of use, setup wizard
- Responsive web design (tablets, mobiles)
- Sensors (1-Wire, industrial 0-20 mA / 0-10 V)
- Various technologies (inverters, meters, heat pumps)
- Alarms (failures, event handling, ESS, inputs - surge protectors)
- Switching outputs due to triggers (power, temperature)
- Energy gateway to other systems (M2M – NMS, PLC)
- Active and reactive power control
- Different transport to cloud (ethernet, GPRS)

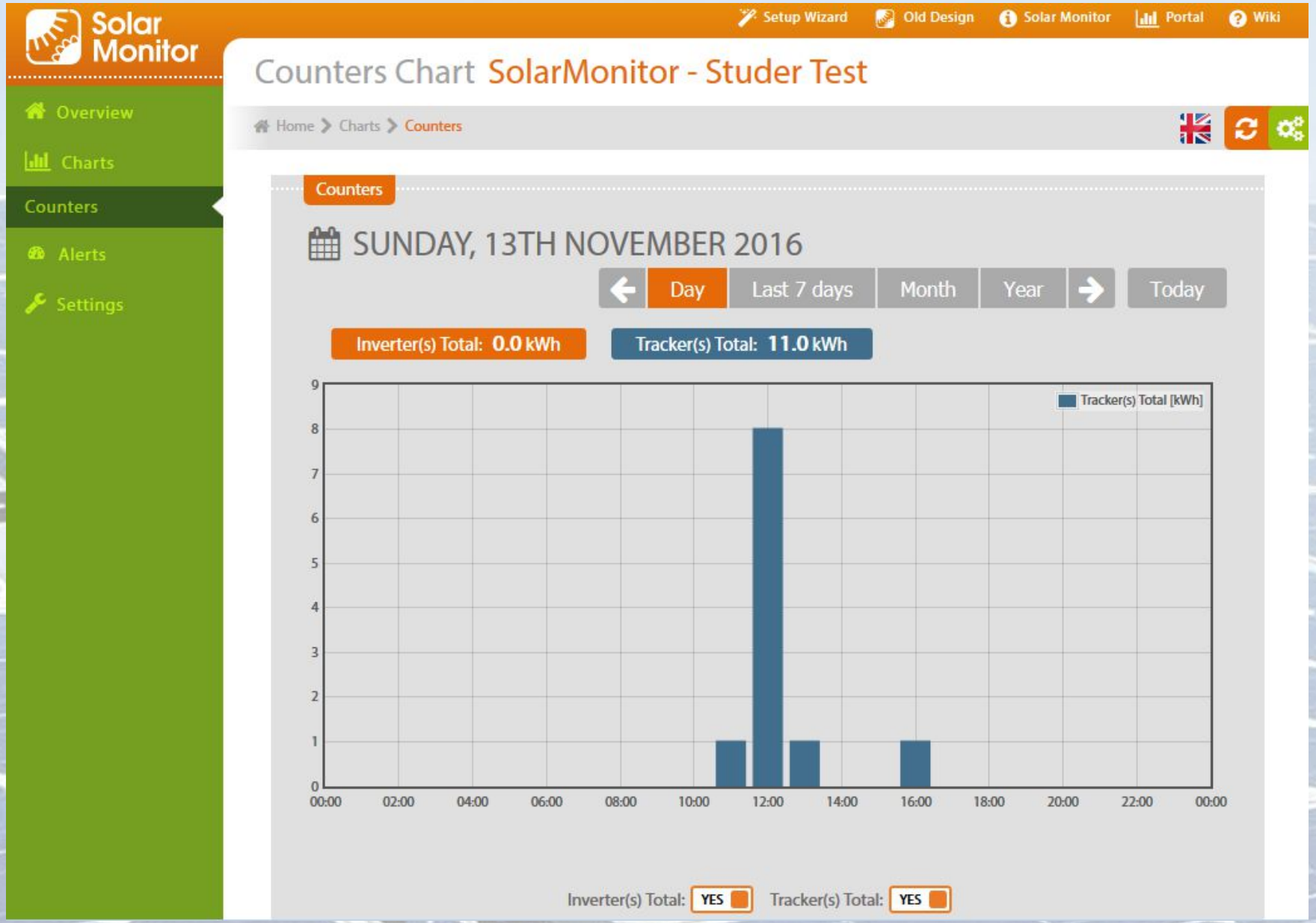
Webserver of the SM2-MU: Responsive Design



Webserver of the SM2-MU: Setup Wizard



Webserver of the SM2-MU: Energy Charts



Advantages, Highlights (WAN)

- Cloud DB + web app
- Mobile app
- Windows gadget
- No need for public IP address
- All energies overview
- Online data, effortless graphs
- Management of different manufacturer products
- Maintenance, support (back channel – config, firmware)
- User privileges (delegating access)
- Customized design, separate databases

Solar Monitor

Monitoring 2

Name Password Login

EN

?

Show 25 entries Search

	Device	Last Update	Produced [MWh]	Peak Power [kWp]	Current power [kW]		
	SVP Solar - Říčany	05.02.2015 12:06:07	11.675	5	1.757	35%	
	Praha 4 - Podolí	27.09.2014 12:35:39	49.944	3.2	0	0%	
	Solar Lhota	26.09.2014 21:44:02	---	---	---	0%	
	FVE Tesla - Praha-východ	05.02.2015 12:08:50	28.54	5.7	4.072	71%	
	FVE Slavkov	05.02.2015 12:01:44	1207.968	258.7	0	0%	
	FVE_Poštorná	05.02.2015 12:05:01	7993.439	1656	0	0%	
	FVE TREBOVA	05.02.2015 12:04:59	---	---	---	45%	
	X	05.02.2015 12:08:04	4.331	4.5	3.87	86%	
	FVE Strojírny Olšovec	05.02.2015 12:05:00	---	---	---	11%	
	FVE_Sudomerice II	18.10.2014 05:50:09	0	500	0	0%	
	Nettl	05.02.2015 12:06:00	16.512	5	0	0%	
	FVE Osadní	05.02.2015 12:09:03	---	---	---	58%	
	FVE Lodherov	05.02.2015 12:05:02	---	---	---	19%	
	FVE Choustníkovo Hradiště II	05.02.2015 12:05:06	---	---	---	45%	
	RD-Bzenec	05.02.2015 12:05:13	39.667	6.4	4.808	75%	
	Přelouč	05.02.2015 12:05:00	8.643	4.8	0	0%	
	FVE Licno	05.02.2015 12:05:12	---	---	---	64%	
	FVE Choustnikovo Hradiste I	05.02.2015 12:05:11	---	---	---	35%	

Solar Monitor

Monitoring 2

SVP Solar - Říčany

EN

Back | Overview | Graphs | Diagnostics | Alarms | Export | Settings

Actual state

State	Online
Last Update	02.02.2015 09:46:10
Peak Power	5.0 kWp
Current power	0.352 kW
Today's Energy Production	0.2 kWh
Today's light exposure	43.3 Wh/m2

Grid Operator Reports

Start Service

More information

OTE

Energy

	Today	Total	Serial Number	Last Update	State
Electrometer	0.2 kWh	11658.4 kWh	1	02.02.2015 09:46:10	✓

Sensors

	Value	Daily Average	Serial Number	Last Update	State
Module Temperature	0.4 °C	-1.4 °C	16194	02.02.2015 09:46:10	✓
Ambient Temperature	3.1 °C	2.2 °C	14797	02.02.2015 09:46:10	✓
Irradiation	4.4 W/m2	4.4 W/m2	54920	02.02.2015 09:46:10	✓

Solar Monitor

Monitoring 2

SVP Solar - Říčany

EN

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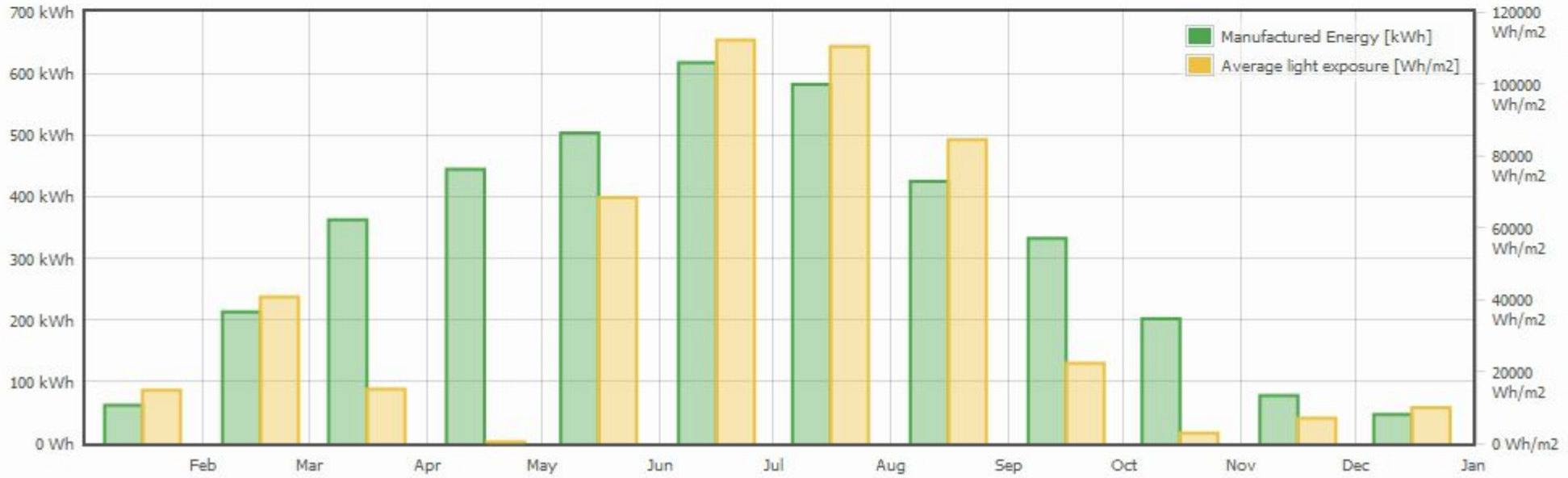
From 01/01/2014 to 12/31/2014 today February 2015

Power production/consumption

Type of production: Electrometer (SN: 1) Irradiance Sensor: Osvit (SN: 54920)

From **01.01.2014** to **31.12.2014** was manufactured **3867.7** kWh.



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Monitoring 2

SVP Solar - Říčany

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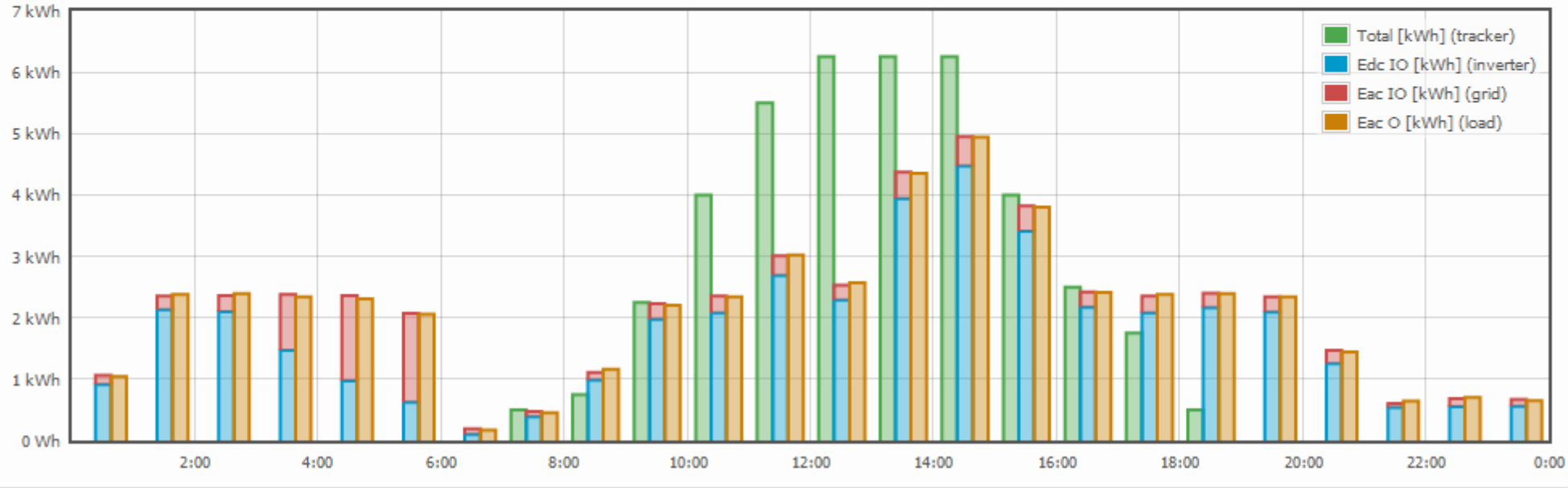
Back | Overview | Graphs | Diagnostics | Alarms | Export

Hybrid PV Plant

From 04/03/2014 to 04/03/2014 today February 2015

Overview of energy

For **03.04.2014** was manufactured **40.5** kWh, do střídače **41.92** kWh, z rozvodné sítě **8.62** kWh, consumed **50.47** kWh.



Complex information about hybrid system behavior, which are normally hidden to customer.

Web Portal: Custom Solutions

Zařízení	Aktualizace	Vyrobeno [MWh]	Inst. výkon [kWp]	Akt. výkon [kW]	
FVE p.Ružička	05.02.2015 12:20:26	11.793	4.7	0.823	18%
FVE p.Brandejs	05.02.2015 12:21:17	17.581	7.3	4.681	64%
FVE p.Plašil st.	05.02.2015 12:20:26	12.587	5.1	4.508	88%
FVE Budik	05.02.2015 12:20:33	9.845	4.7	1.019	22%
FVE p.Bednář	05.02.2015 12:21:02	63.002	29.6	20.942	71%
FVE p.Plašil ml.	05.02.2015 12:21:07	11.606	5	3.334	67%
FVE p.Lorenc	04.02.2015 18:30:29	30.968	14.7	0	0%
FVE p.Brandejs	05.02.2015 12:20:21	48.969	23.7	15.443	65%
FVE p.Forejtek	05.02.2015 12:21:21	26.038	11.7	9.348	80%
FVE Fejfarovi	05.02.2015 12:21:44	10.602	5.5	1.182	21%
FVE EKO Plyn	05.02.2015 12:21:39	40.778	20.7	5.69	27%
FVE p.Löwy	05.02.2015 12:21:10	18.697	9.7	1.982	20%
FVE p.Horáček	05.02.2015 12:21:49	10.145	4.6	1.131	25%

M2M + PLC: Symo Hybrid Charging Optimization

- 4x Fronius Symo Hybrid + Sony battery

  3x Fronius IG120-Plus

  Fronius Smartmeter

  SM2-MU-300

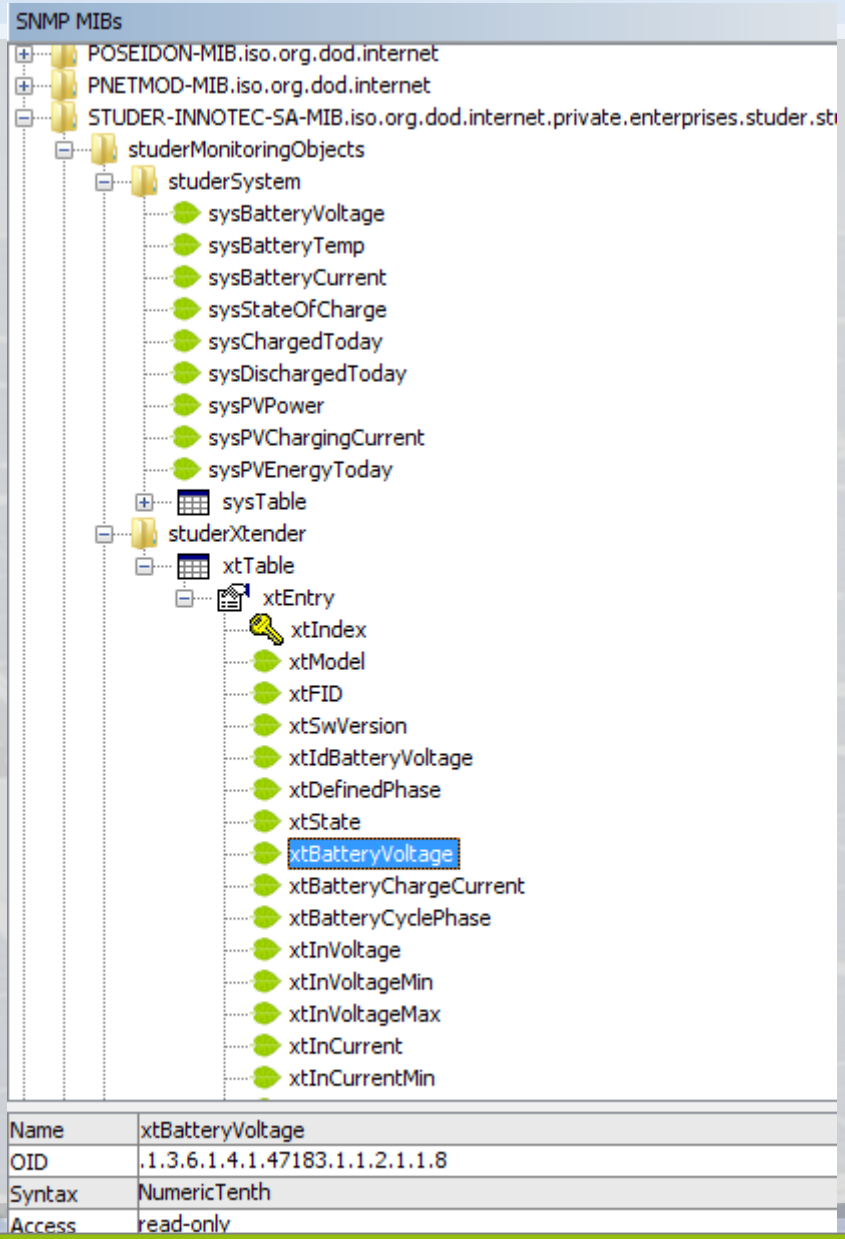
  PLC Teco Foxtrot
- Originally unsuitable battery charging / discharging
- Energy flow monitoring in the system
- Charging parameters control due to system state

M2M + PLC Example: Golf Club 50 kWp PV Plant

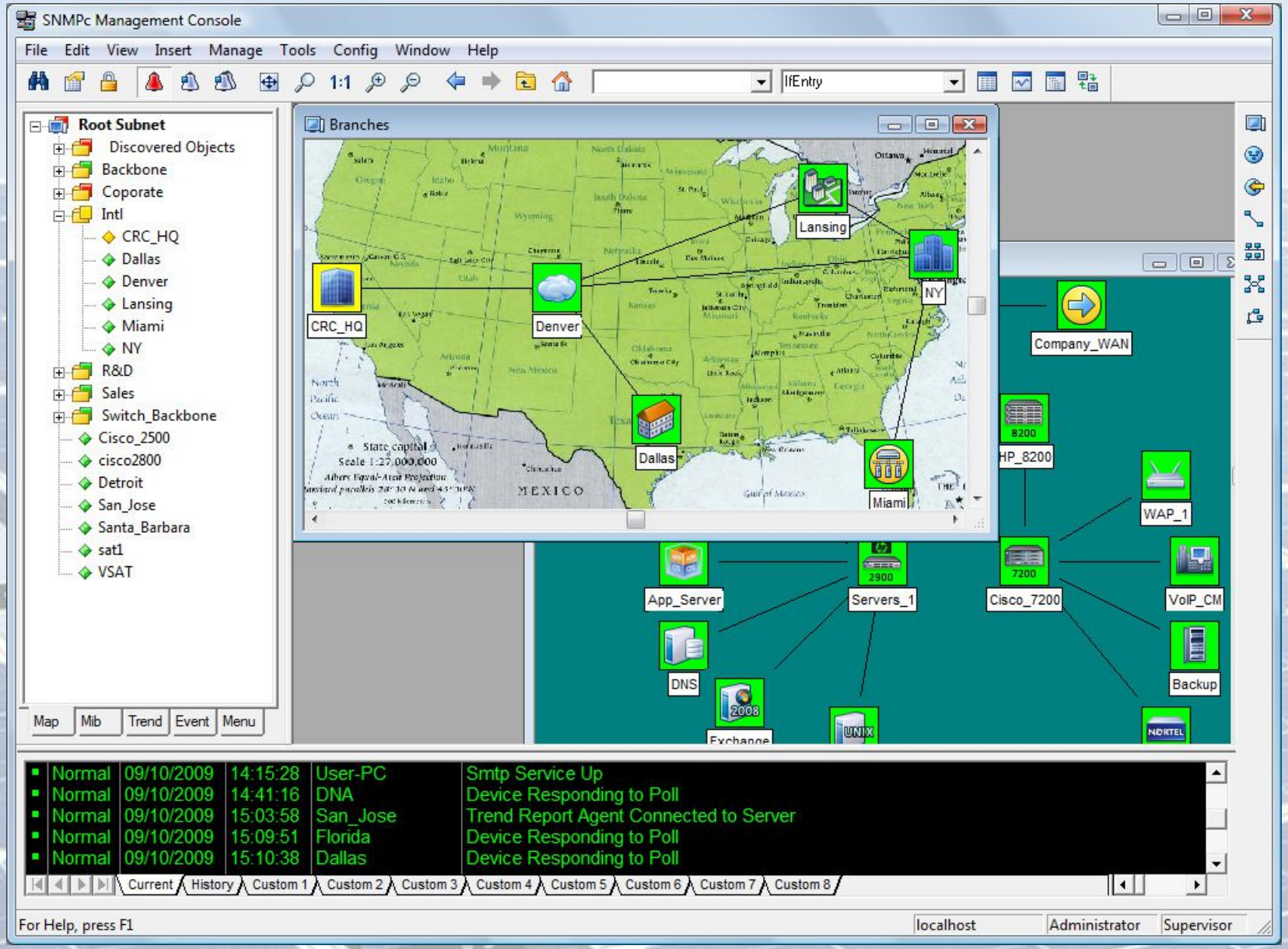
What SNMP stands for?

- Network Management Systems
  - telecommunication industry
  - already installed software, trained staff
- Simple Network Management System (SNMP)
- Management Information Database (MIB)
  - tree structure, enterprise, IANA
  - leafs, tables, indexes
  - how Studer fits into it?
- Services
  - versions (v1, v2c, v2, v3)
- Security (v3, AES / DES encryption)

SNMP – iReasoning Browser: Studer MIB



SNMP – Castlerock SNMPc: Geographical Maps



Any questions are welcome!

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