Solar Monitor
Portal Features

Frontend features	
Overview	Quick report of device statuses.
Graphs	Interactive flot graphs, most of them with an interactive zoom option. Displayed data can be exported with form based wizards.
Production overview	Graphical comparison between produced energy and measured irradiance.
Energy balance	Graphical representation of energy flowing into and out of the system - consumption from grid, supply to the grid, production from inverters / MPP trackers, energy from DC bus (batteries) into and out of an inverter, load consumption. These energies can be supplemented with info from electrometers. Stacked bars give human understandable meaning of what is happening in a hybrid system.
Devices	Individual variable historical data are graphed and can be displayed in for various periods / day / month / year / custom period. Energies are displayed as bars, other values are displayed as lines. You can click on bars to navigate into narrower period, on up arrow to widen a period, on left or right arrow to move selected period. Easy navigation 2 graphs can be compared to evaluate possible differences.
Audit	Graphical comparison between estimation and real production. Estimation can be manually typed in or automatically loaded from PVGIS system.
Performance ratio	Graphical representation of a PV plant's efficiency.
Diagnostics	Inverter production and stringbox measurements can be compared and if differences are encountered, event is scheduled. Comparison parameters can be configured. Advantage against usual stringbox evaluation, which is done mostly on a day basis, is you can select an individual period for the comparison.
Alarms	There are 3 alarm types: 1. Those generated by devices, connected to

	the SM2-MU (datalogger unit). 2. Events generated by the SM2-MU datalogger. 3. Events generated by the Portal (cloud engine).
Export	Data collected in the cloud database can be exported into CSV files. We also did some custom exports directly into Excel format with already created graphs and highlighted colored statistic evaluations in generated spreadsheets – e.g. production comparison between selected plants.
Setup	The Portal behaviour can be parameterized, some variable sources can be hidden from further processing.
OTE (Czech Republic only)	Sophisticated reporting and automatic invoicing system based on asynchronous bidirectional encrypted communication with certificates between the cloud engine and the OTE (Country Electricity Market Operator). This maximally eases required legislative steps for feed-in tariffs.
Access log	All actions are logged, so user visits are monitored.
Customization	
Database	We have clients, who asked for a separate database for their plants. Advantage of this is a speed and a possibility for custom graphics.
Graphics	The cloud portal can be customized.
Administration	
Level manipulation	Administrator for its level can maintain logical plants, he can aggregate more physical datalogger units to form a bigger one with more devices, sensors and inputs. He can add users and assign passwords.
Sublevel right passing	A sublevel can be created to form a hierarchical tree structure, e.g. producer → distributor → supplier → end user levels.
Management	AKA Back channel commands
Datalogger parameters	Devices without a public IP address, hidden behind firewalls, cannot be configured directly by accessing their web interfaces. Instead of this, parameter setup requests can wait for

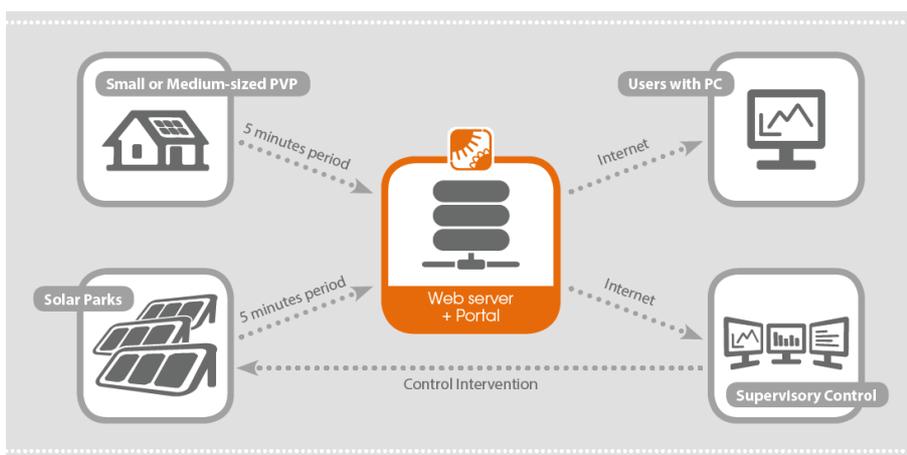|	
	a datalogger unit until it connects to the cloud engine to get them.
Firmware upgrade	Individual datalogger units or a set of them can be selected for a firmware upgrade.
Data logging	
Period	>5 minutes (configurable)[1]
Delayed data transmission	In case of an Internet connection failure, data are stored at the datalogger (used data card can hold data for more than a year, depending on a sending period and number of devices and sensors being logged).
Supported Devices	
Inverters, charge controllers, stringboxes	AEG, Carlo Gavazzi, Danfoss, Delta, Diehl, Fronius, Kaco, Kostal, Mastervolt, Morningstar, Omnik, Omron, Pairan, Power-One, Power-Trap, Refusol, Riello UPS, Santerno, Satcon, Schneider-Electric, Siemens, Siliken, SMA, SolarEdge, Solarmax, Solutronic, Steca, Studer, Sungrow, Sunville, Sunways, Vacon, Xantrex
Meters, safety relays, consumption regulators	ABB (REX521), Carlo Gavazzi (VMU-E/X), Fronius (Smart Meter), KMB (SMC-144, PA-144), Phoenix Contact (MA200/250), Schneider-Electric (SEPAM, PM9), Solar Controls (WattRouter), Yorix (GreenBonO), ZPA (IEC 62056-21)

Illustration 1: Communication diagram

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1 Data are being read from devices every second. If communication speed is low and more devices are present on a bus, 1 second period is extended. Average values are then sent to the Portal, where weight averages are calculated due to different sent periods.
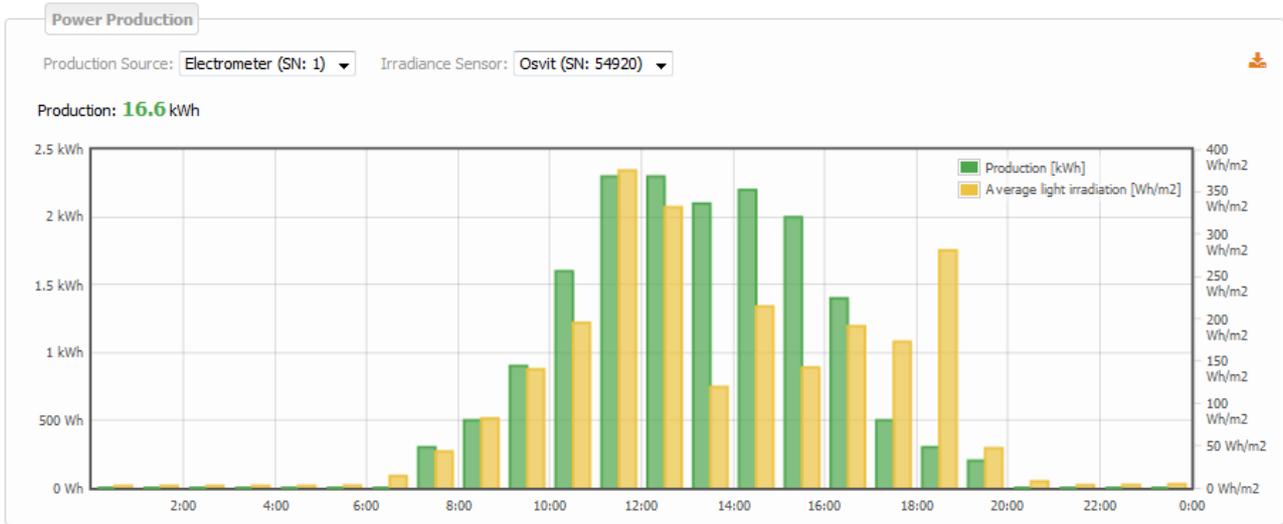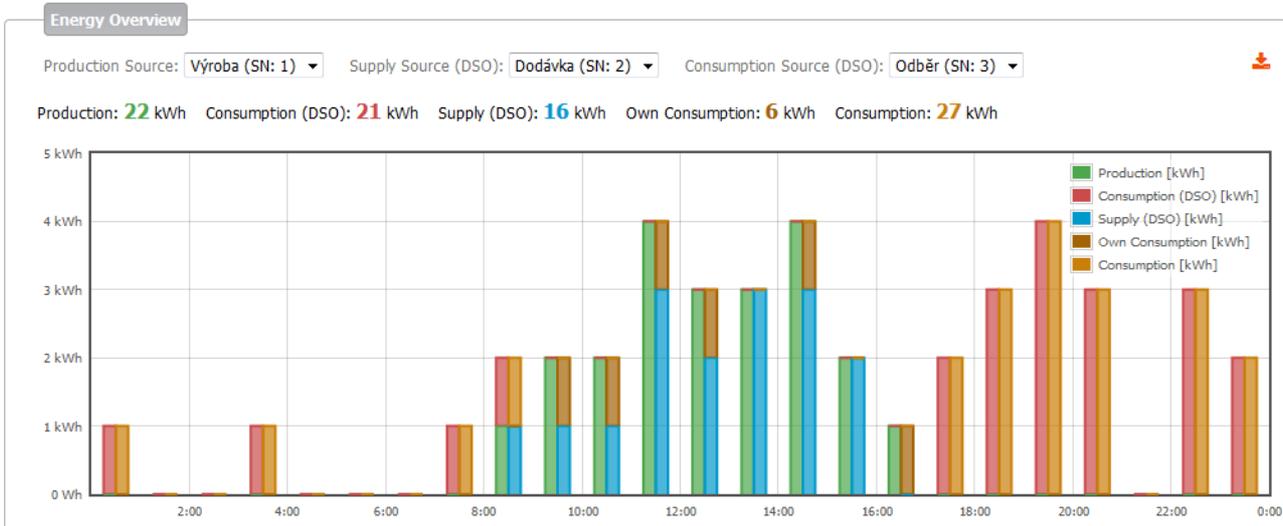
Illustration 2: Production and Irradiation
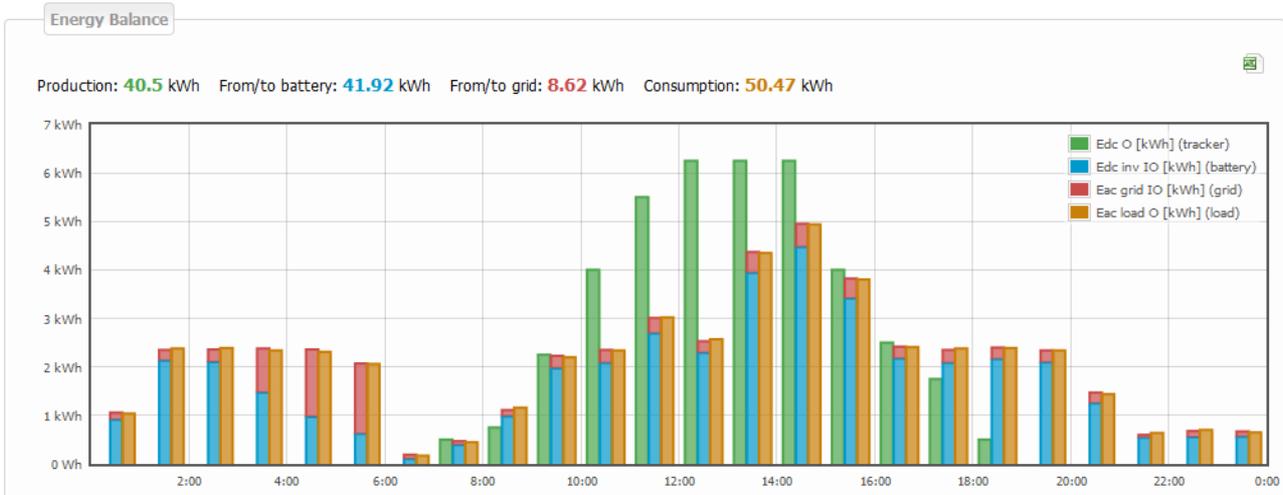

Illustration 3: Energy balance
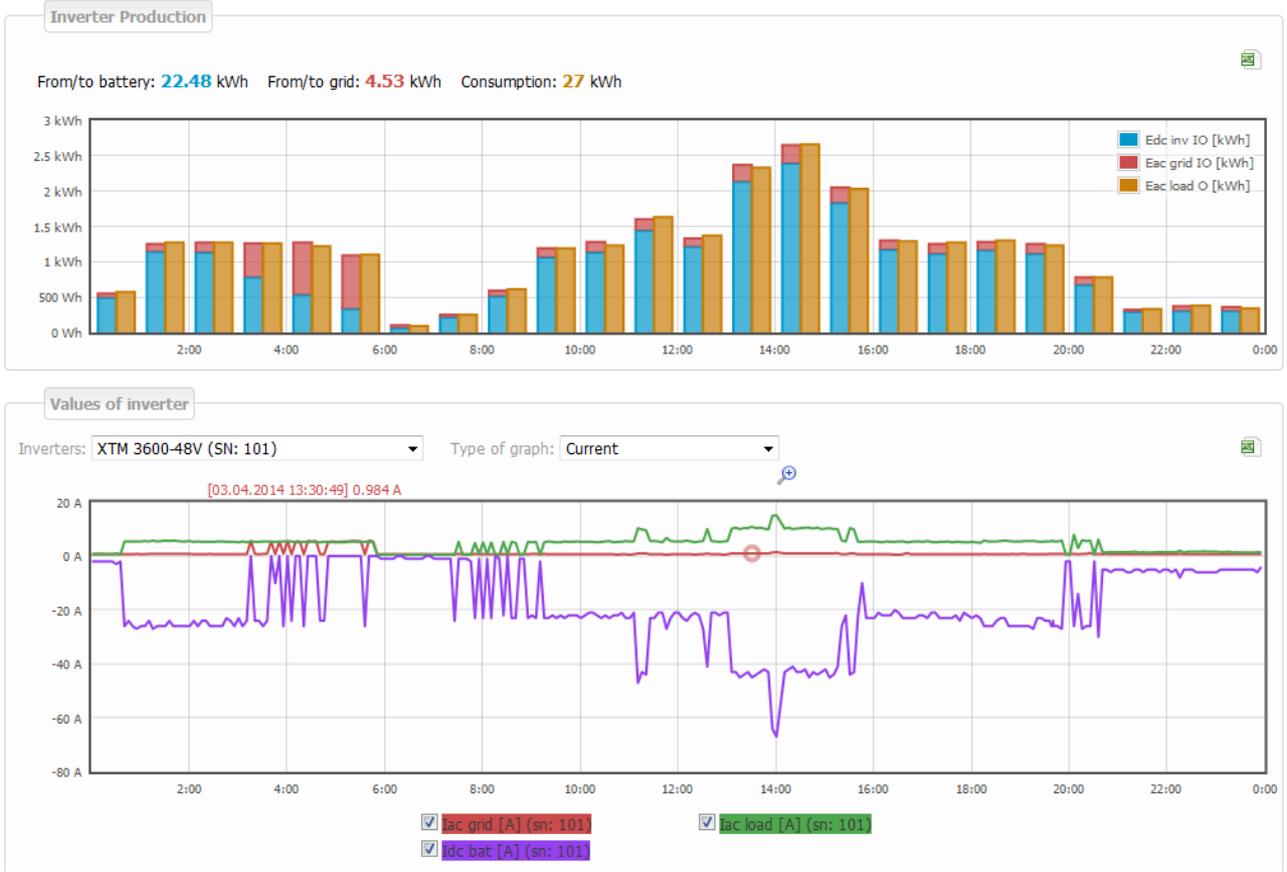

Illustration 4: Hybrid system

Illustration 5: Device graphs

Illustration 6: Comparing selected values