



Monitoring of PV systems installed in the built environment

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Location

- Eastern Europe
- Romania, Braşov
- Temperate climate
- Mountain area
- Carpathians
- Elevation: ~ 550 m

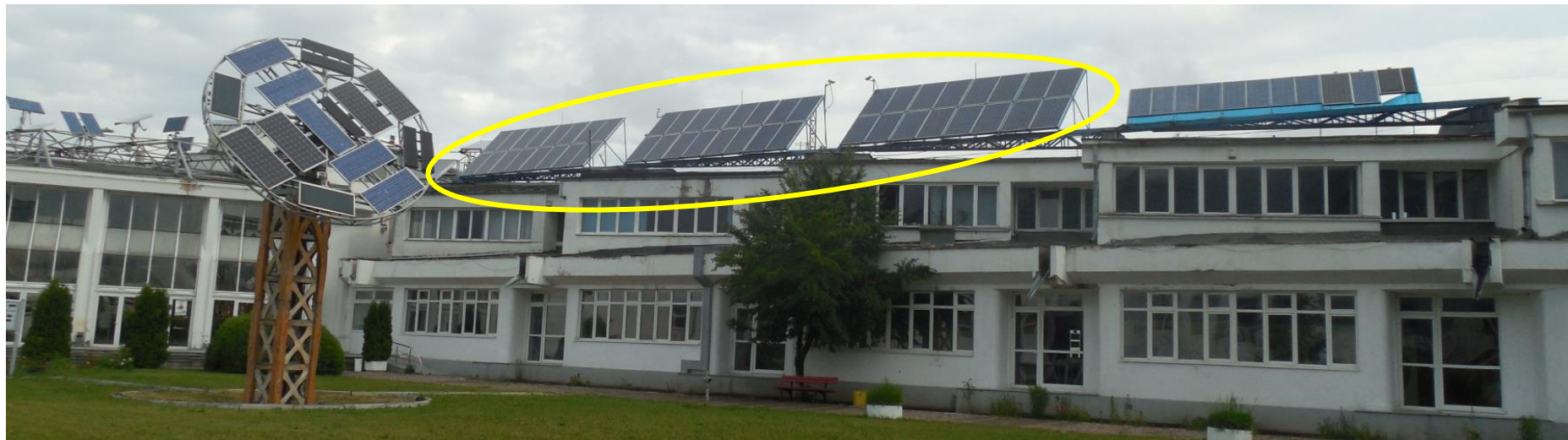


Renewable Energy Systems and Recycling R&D Centre Colina Hill



Colina Hill - 9.6 kWp fixed PV system

- Inverters:
 - 2x SMA Sunny Boy 3300
 - 1x SMA Sunny Boy 1700
- Modules:
 - 48x pSi (ES200Wp)
- Installed power: 9600 Wp



Colina Hill - 9.6 kWp fixed PV system

Simplified monitoring scheme

SB inverters



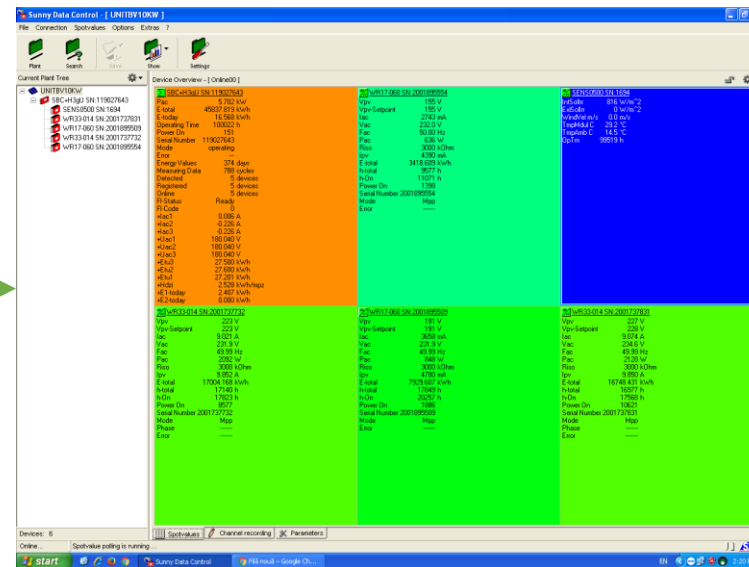
SB control



SB
Sensorbox



Sunny Data Control



SUNNY PORTAL

PV System Profile | UniTBv_10kW

Location: Brasov, Romania
Commissioning: 11/5/2015

PV system power: 10.600 kWp

Communication: Sunny Boy Control Plus
Sunny WebBox
Inverter: 2 x Sunny Boy 1700
2 x Sunny Boy 3300
Sensors: Sunny Sensorbox

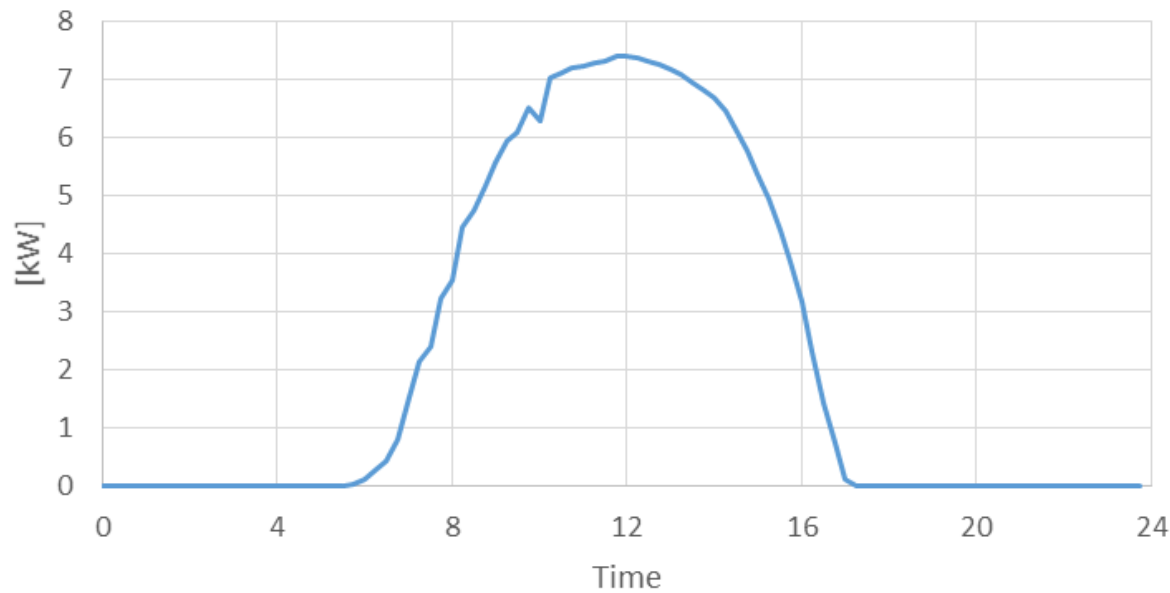


Colina Hill - 9.6 kWp fixed PV system

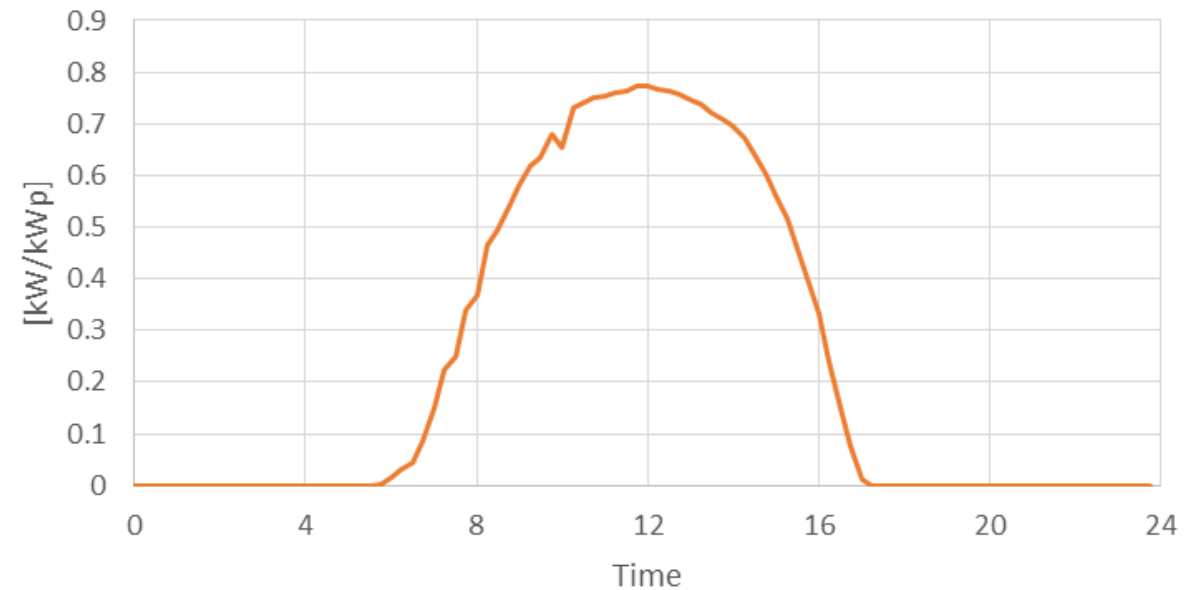
Monitoring data, 12.03.2022

- Data:
 - Overall
 - Inverter based

PV power



produced / nominal PV power



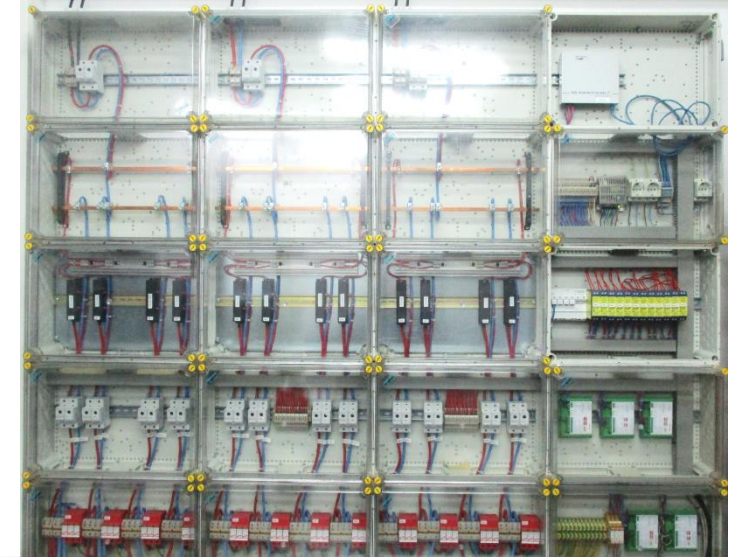
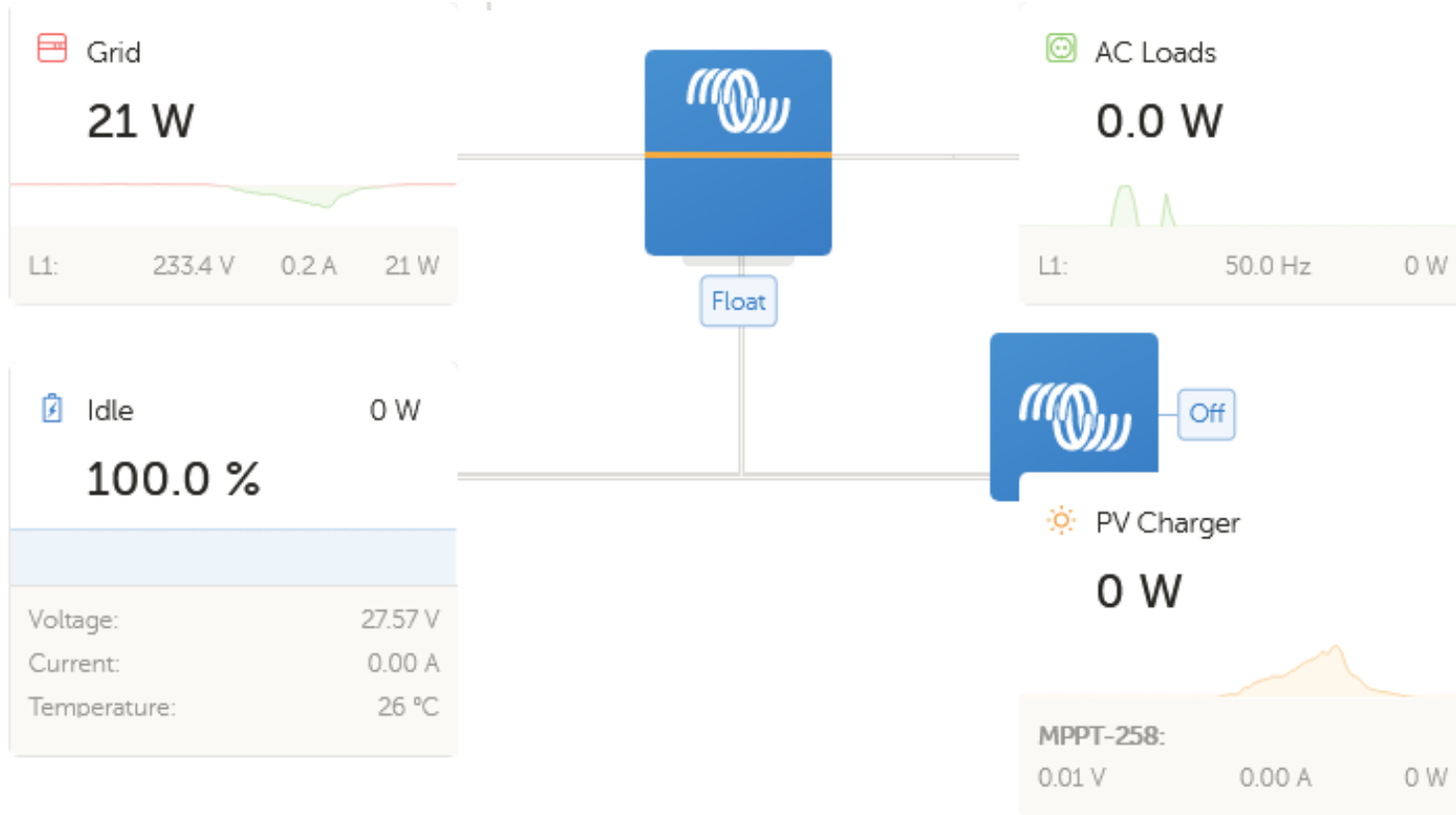
Colina Hill - 1.3 kWp tracked PV platform

- Twin platform => Zwickau, Germany
- Hybrid Inverter:
 - Victron Multiplus Compact 24/1600/40
- Modules:
 - 3x mSi (SW 175 W)
 - 4x pSi (SW 140 W)
 - 1x aSi (EPV 40 W)
 - 4x CIS (ST 40 W)
- Installed power: 1285 Wp



Colina Hill - 1.3 kWp tracked PV platform

Simplified monitoring scheme

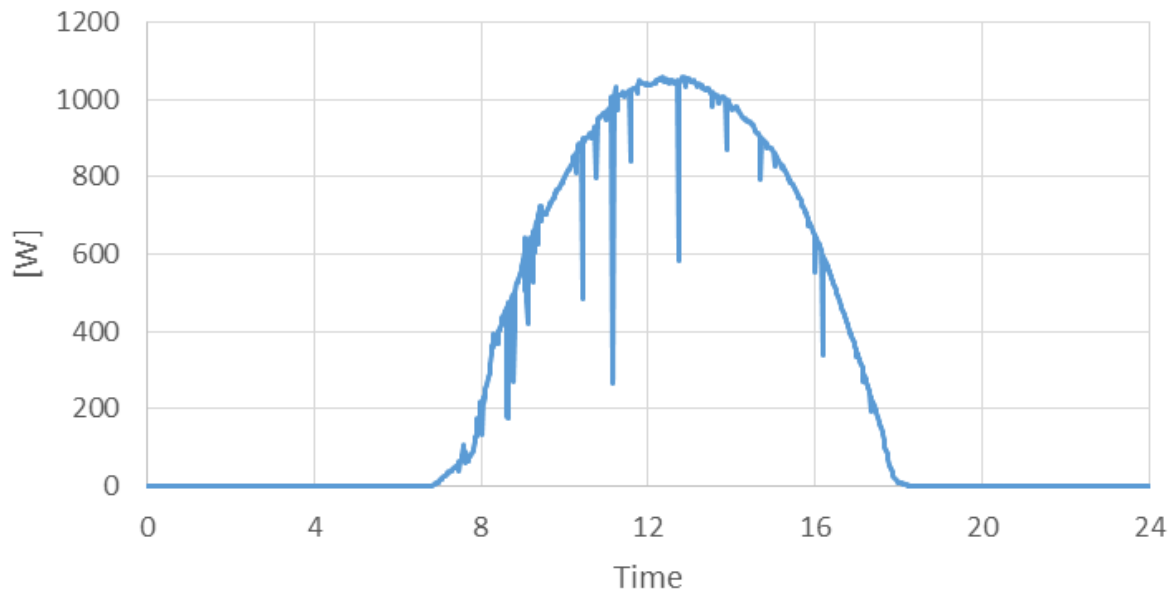


Colina Hill - 1.3 kWp tracked PV platform

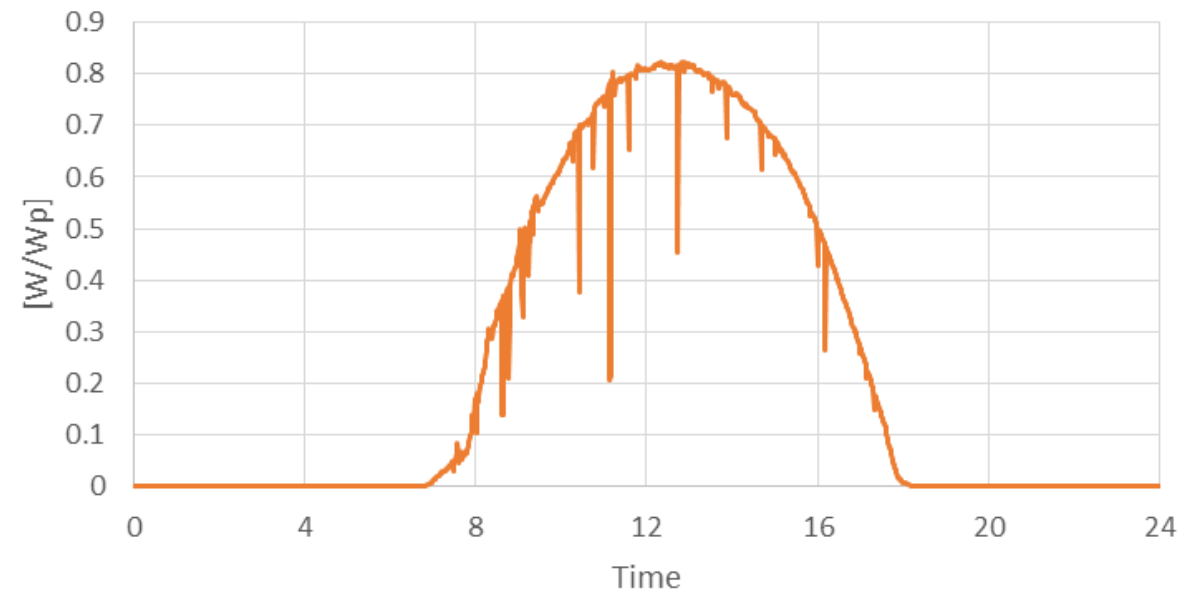
Monitoring data, 12.03.2022

- Data:
 - Overall
 - PV module type

PV power



produced / nominal PV power



Colina Hill - 2.8 kWp tracked PV modules

- 11 tracked PV systems:
 - different mechanisms
 - different tracking algorithms
- Micro-inverters
 - 11x Enecsys SMI-240-60
- Modules:
 - 12x pSi (NP130GK)
 - 5x mSi (HEE215M A68)
- Installed power: 2810 Wp



Colina Hill - 2.8 kWp tracked PV modules

Simplified monitoring scheme

Micro-inverter



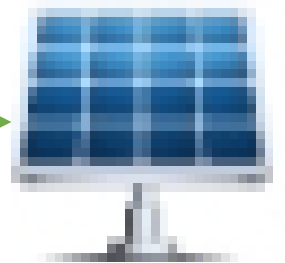
Antenna



Gateway



Aloaha Solar DataCollector

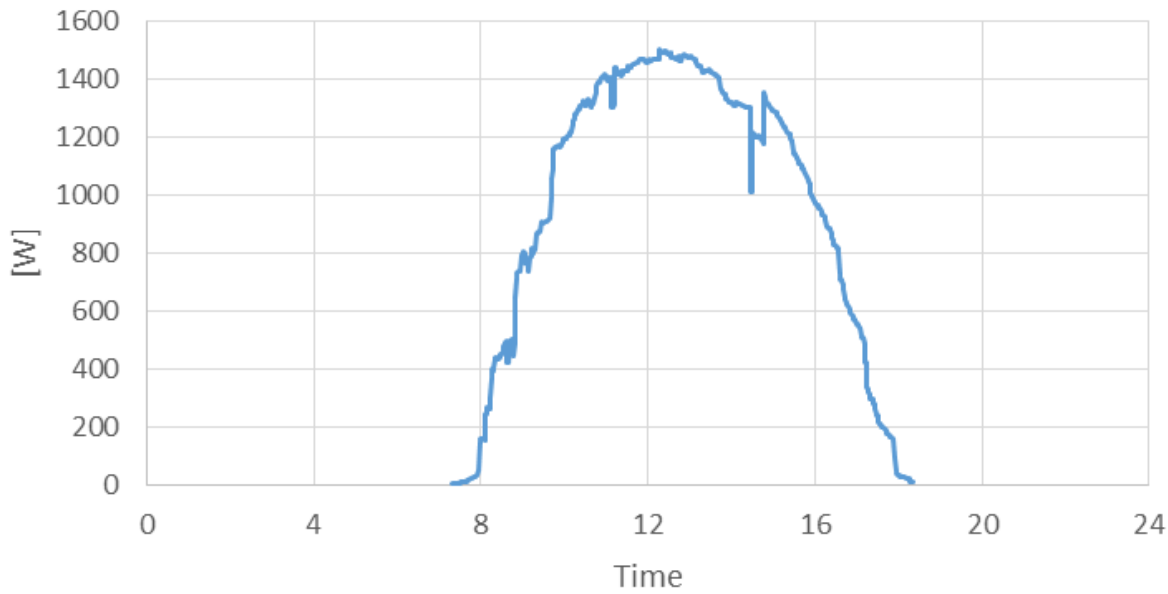


Colina Hill - 2.8 kWp tracked PV modules

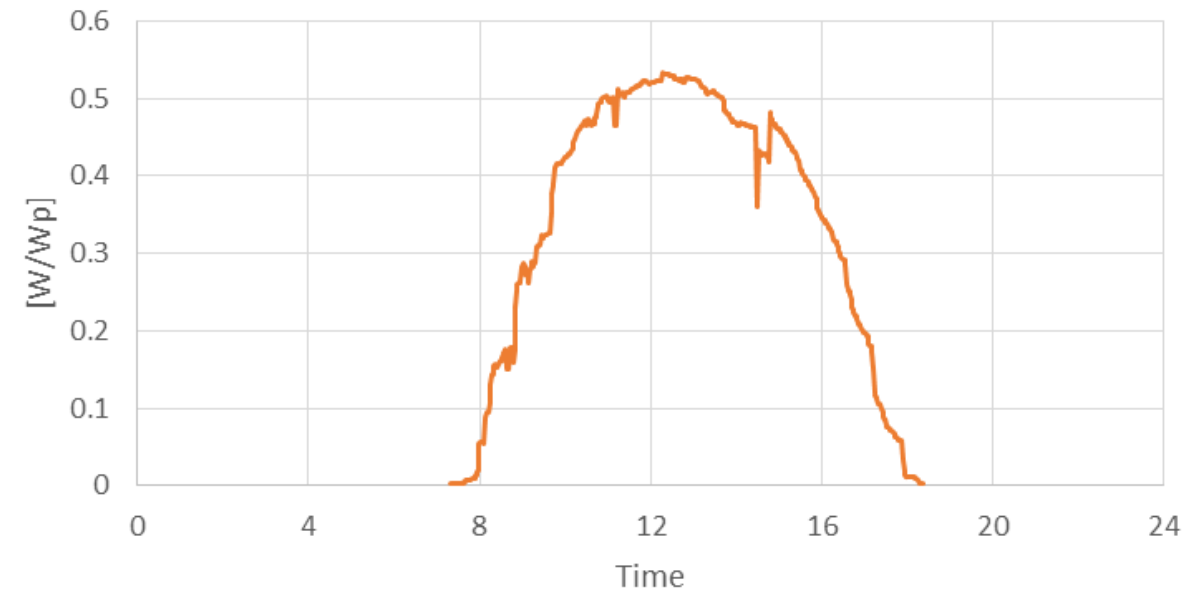
Monitoring data, 12.03.2022

- Data:
 - Overall
 - Micro-inverter based

PV power



produced / nominal PV power



ICDT Research Institute - 5.5 kWp fixed PV system

- 22 PV modules at different positions / orientations

- Inverter:

- 1x Solaredge SE-5000
- 22x SE power optimizers

- Modules:

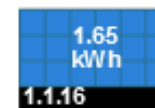
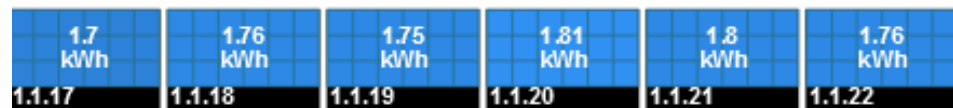
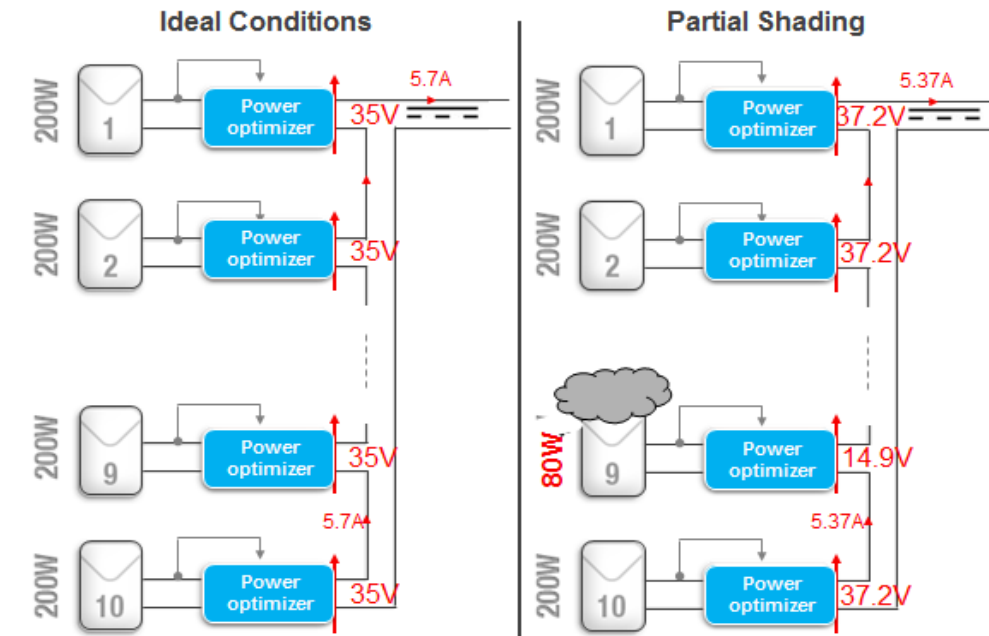
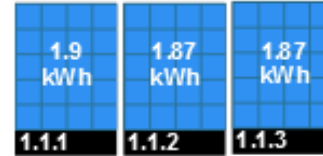
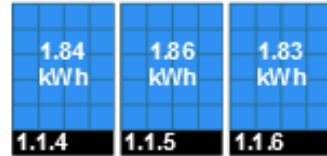
- 12x pSi (LDK-250-P-20)
- 6x mSi (HEE215M A68)
- 2x mSi (PVT PowerVolt 200)
- 1x mSi (TSM-190DC01A.05)
- 1x aSi (2x PowerBond ePVL-136)

- Installed power: 5522 Wp



ICDT Research Institute - 5.5 kWp fixed PV system

Simplified monitoring scheme

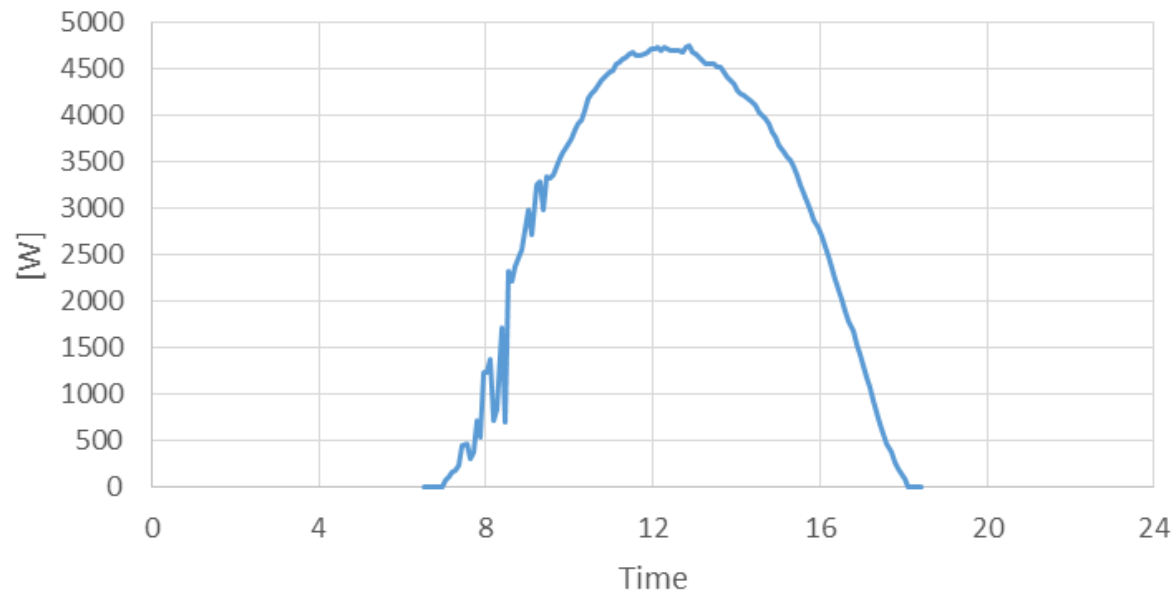


ICDT Research Institute - 5.5 kWp fixed PV system

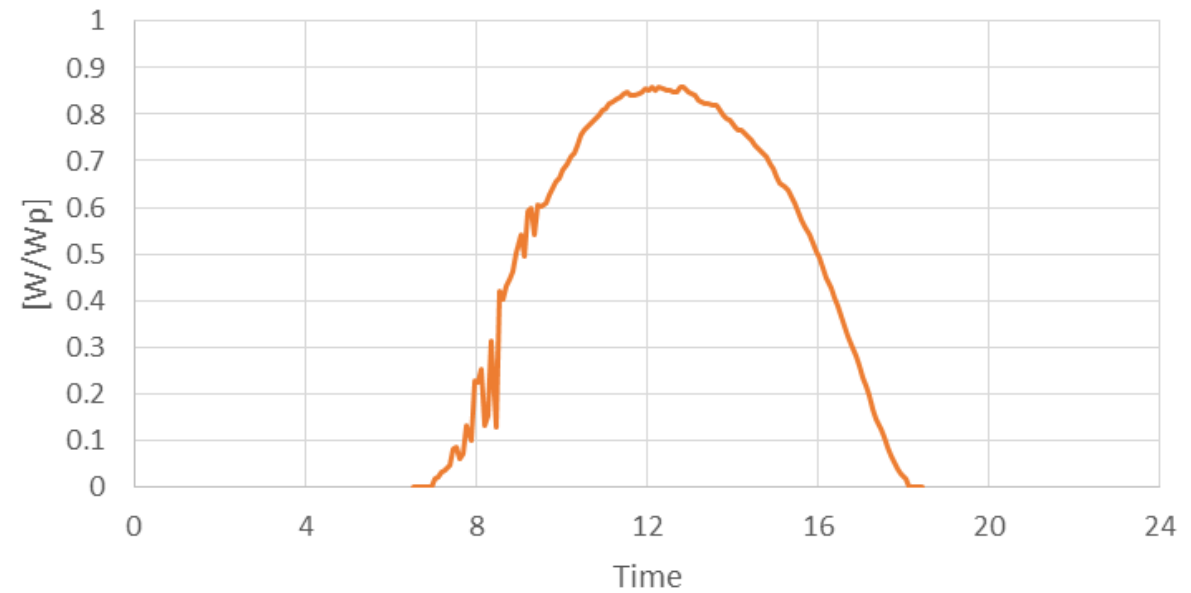
Monitoring data, 12.03.2022

- Data:
 - Overall

PV power



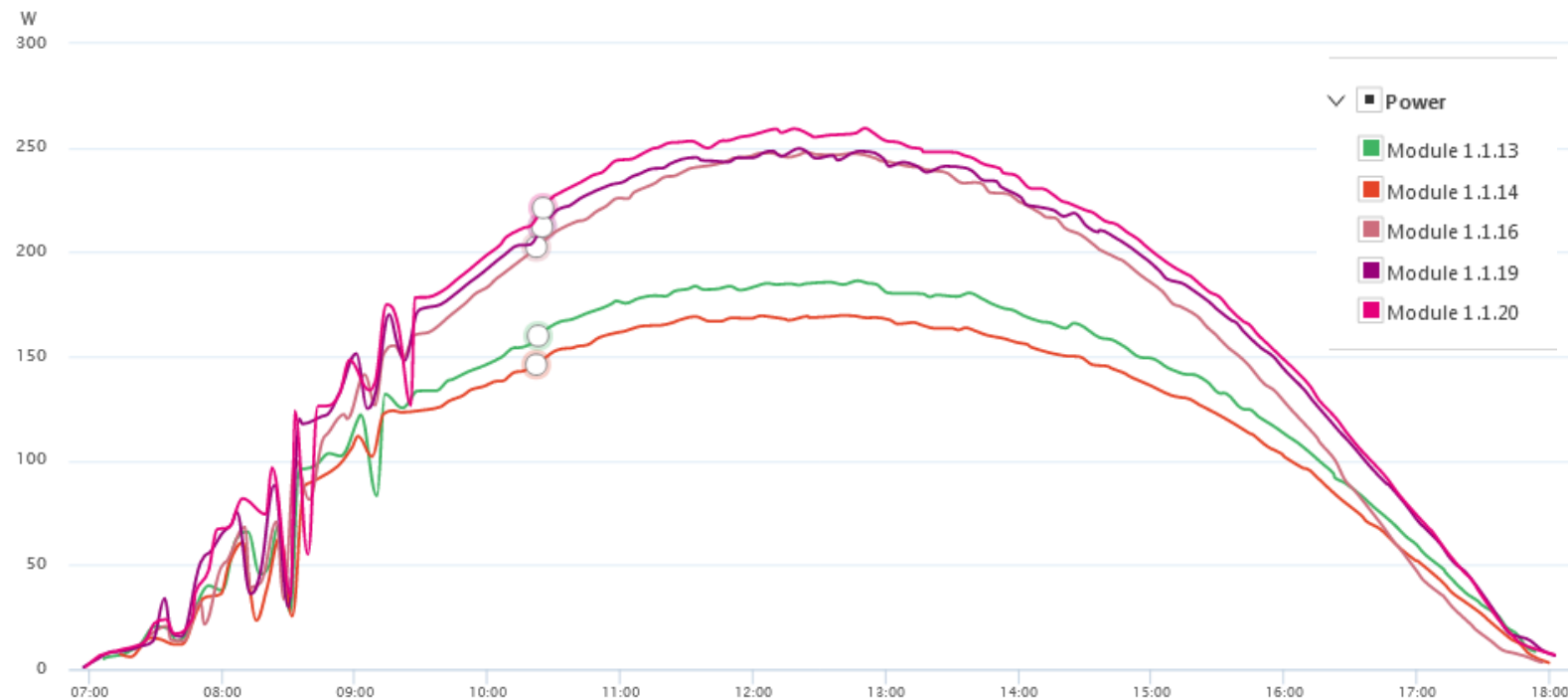
produced / nominal PV power



ICDT Research Institute - 5.5 kWp fixed PV system

Monitoring data, 12.03.2022

- Data:
 - Power optimizer based
- PVT mSi modules are under-performing (lower installed power)



ICDT Research Institute - 9.5 kWp tracked / fixed PV platforms

- Inverter:
 - 5x SE-2200-ER inverter
 - 38x SE power optimizers
- Modules:
 - 16x pSi (LDK-250-P-20)
 - 16x mSi (HEE215M A68)
 - 2x CIGS (2x SL2-120)
 - 2x CdTe (3x CX3-80)
 - 2x CIS (2x PowerMax 125)
- Installed power: 9460 Wp



ICDT Research Institute - 9.5 kWp tracked / fixed PV platforms

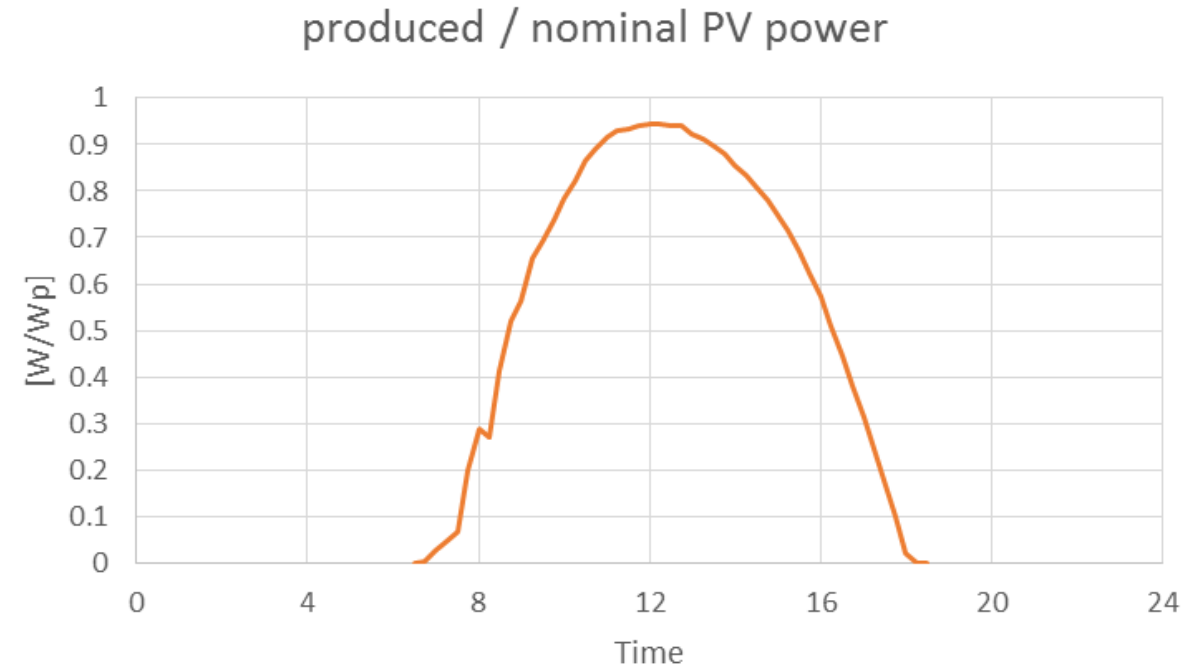
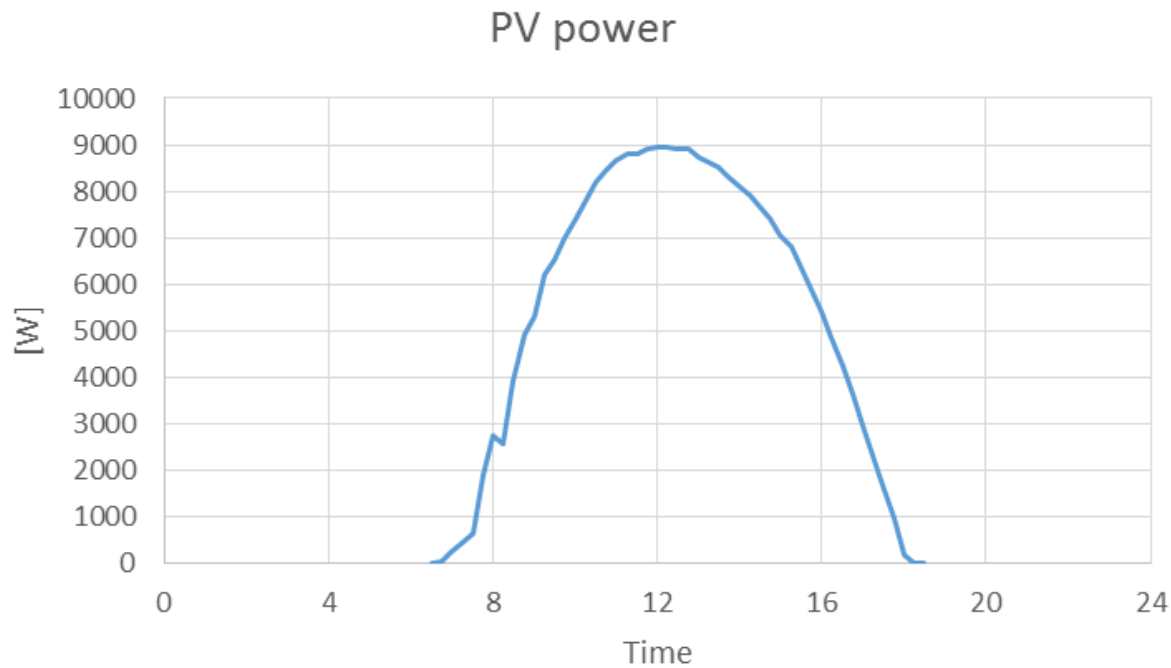
Simplified monitoring scheme



ICDT Research Institute - 9.5 kWp tracked / fixed PV platforms

Monitoring data, 12.03.2022

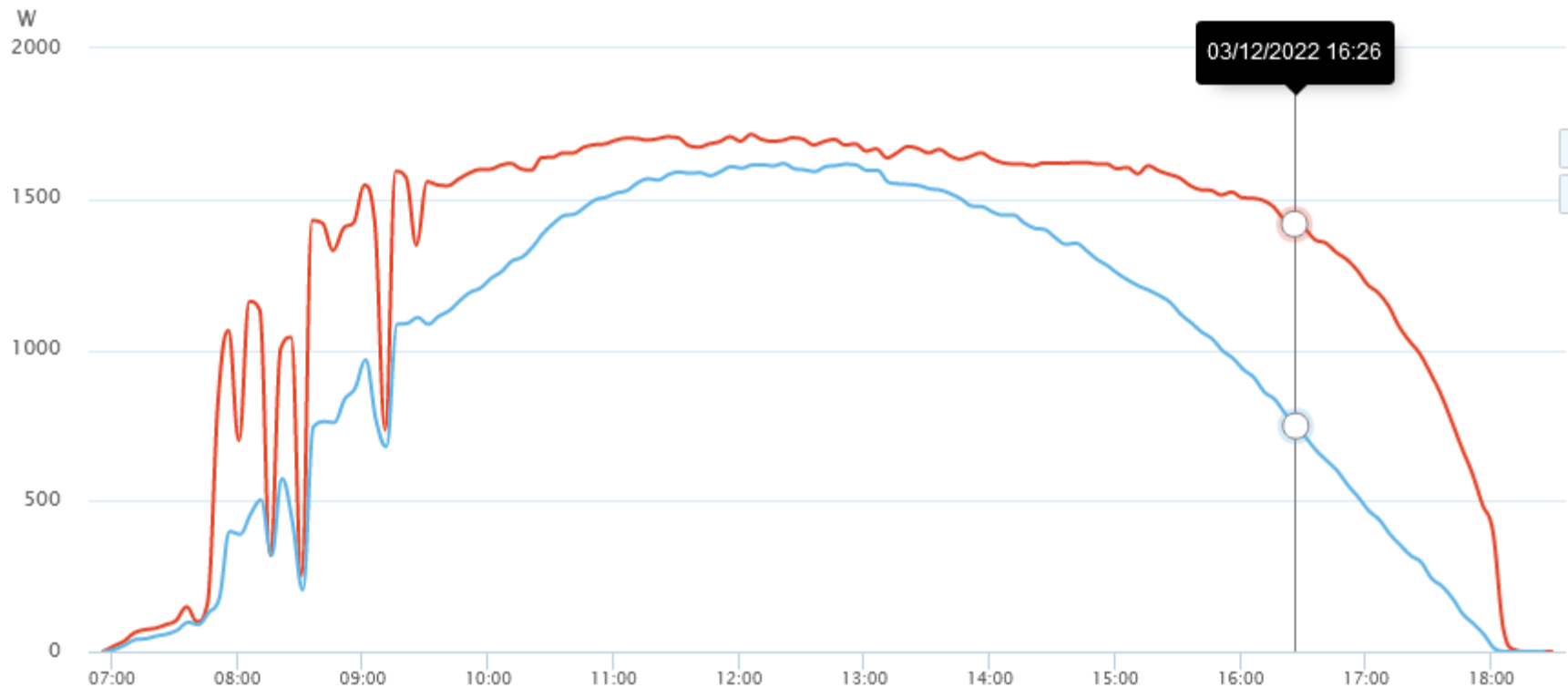
- Data:
 - Overall



ICDT Research Institute - 9.5 kWp tracked / fixed PV platforms

Monitoring data, 12.03.2022

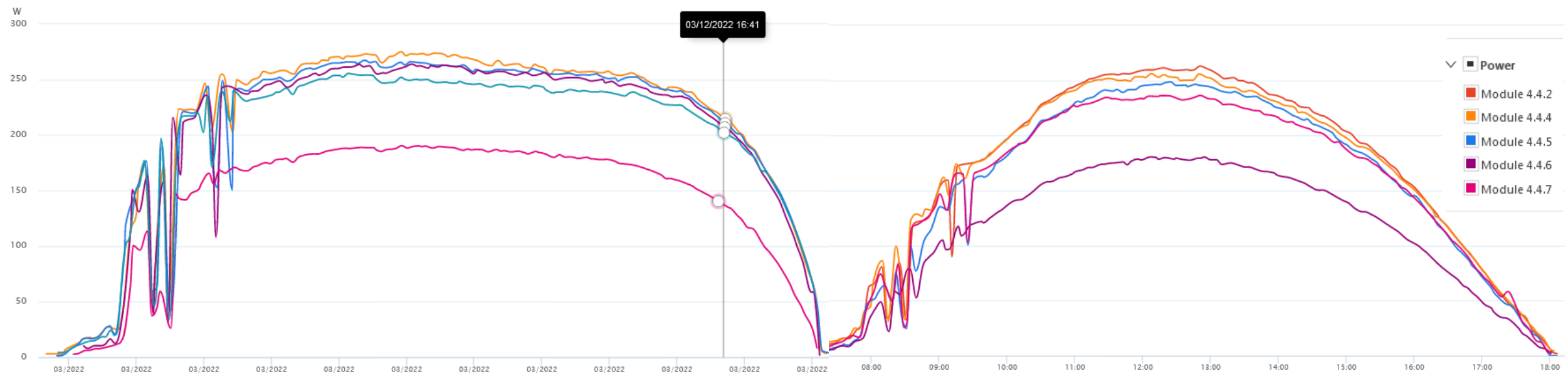
- Data: tracked vs. fixed platforms



ICDT Research Institute - 9.5 kWp tracked / fixed PV platforms

Monitoring data, 12.03.2022

- Data:
 - Power optimizer based, tracked vs. fixed modules
- CdTe modules are under-performing (having same installed power)



ICDT Research Institute - 12 kWp tracked PV platform

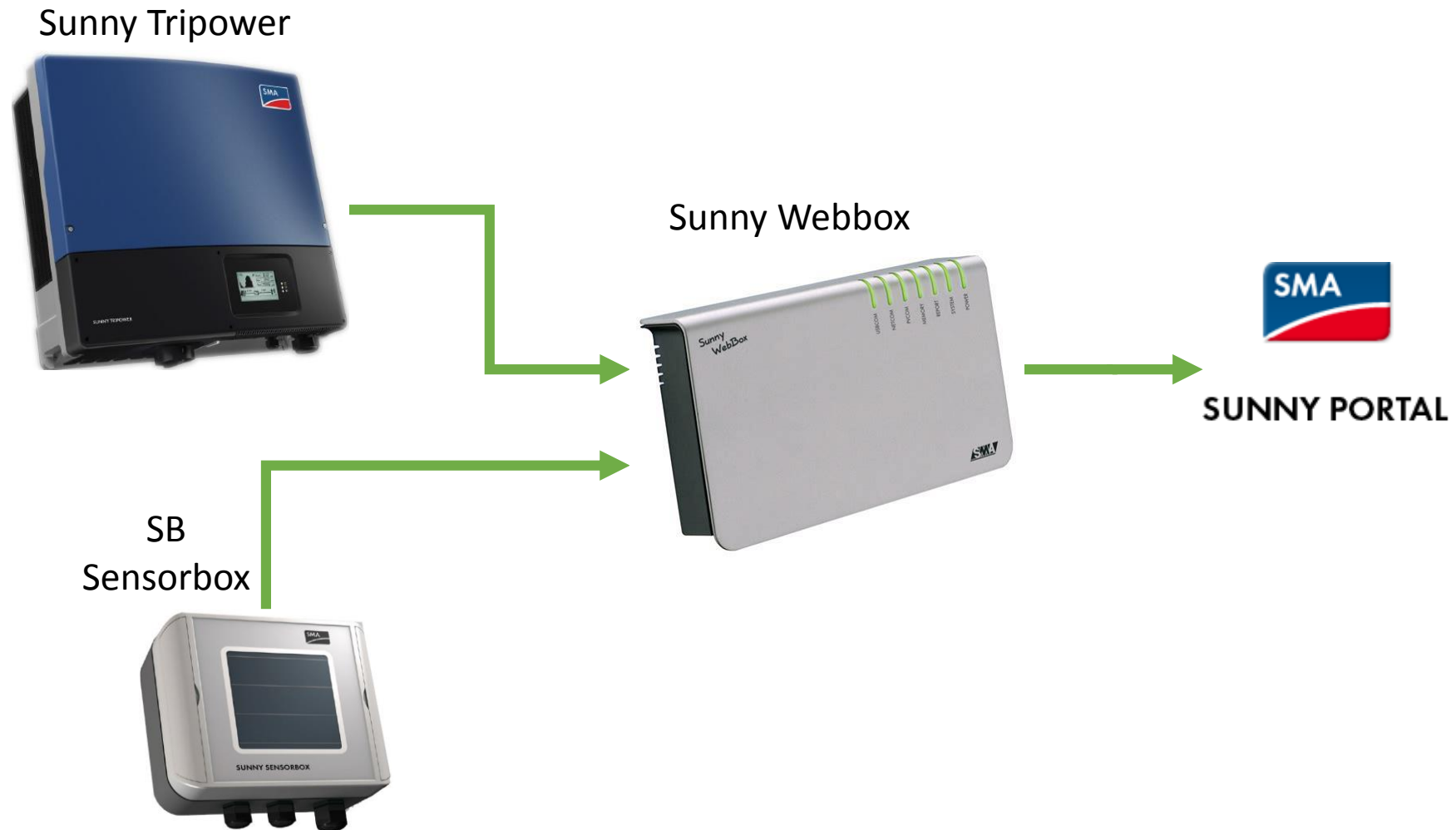
- Inverter:
 - 1x SMA Sunny Tripower 10000TL-10
 - classic serial connection on 2 strings

- Modules:
 - 24x pSi (LDK-250-P-20)
 - 24x mSi (HEE215M A68)
- **Installed power: 12000 Wp**



ICDT Research Institute - 12 kWp tracked PV platform

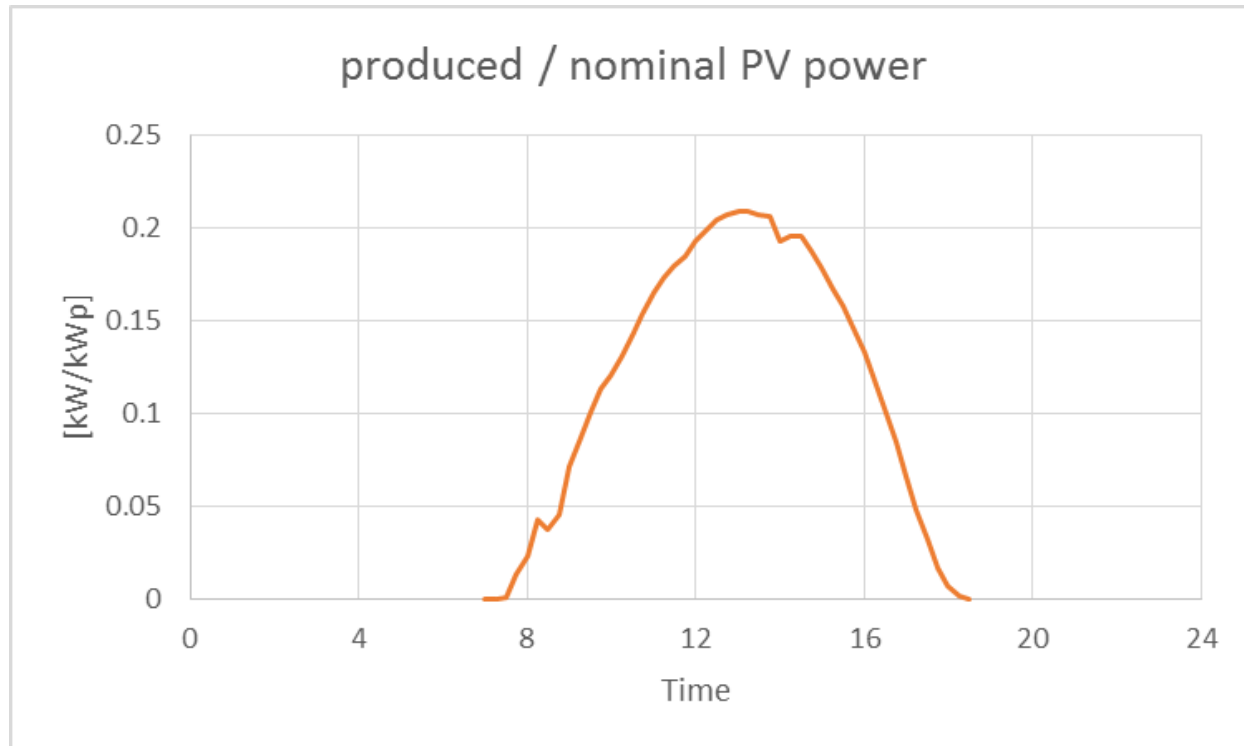
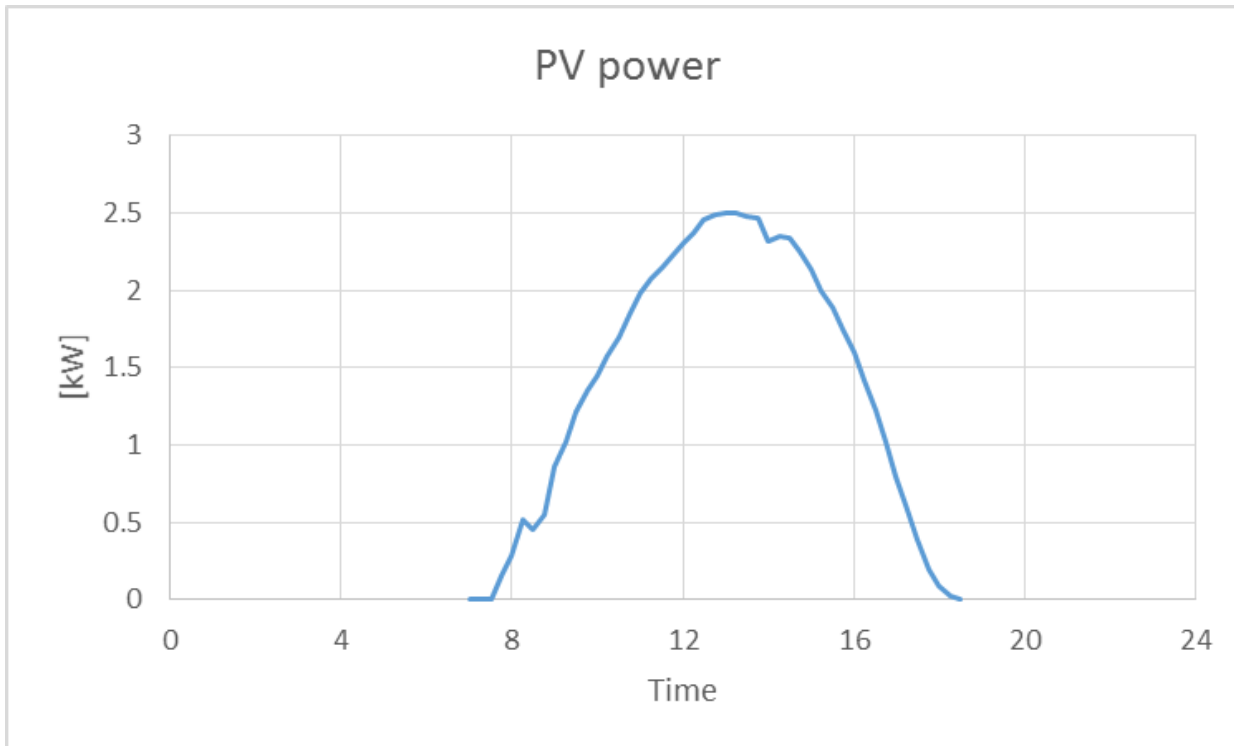
Simplified monitoring scheme



ICDT Research Institute - 12 kWp tracked PV platforms

Monitoring data, 12.03.2022

- Data:
 - Overall



Renewable Energy Systems and Recycling R&D Centre

Monitoring of solar irradiance and meteorological conditions

Solys 2 - irradiance



DeltaT - meteo



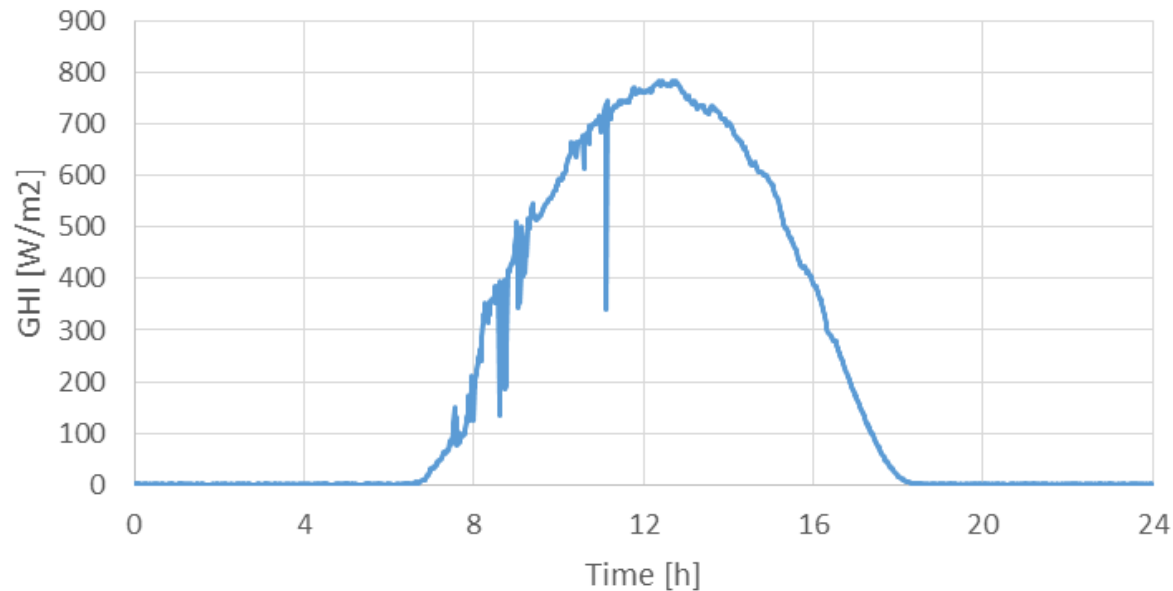
Addcon - wind



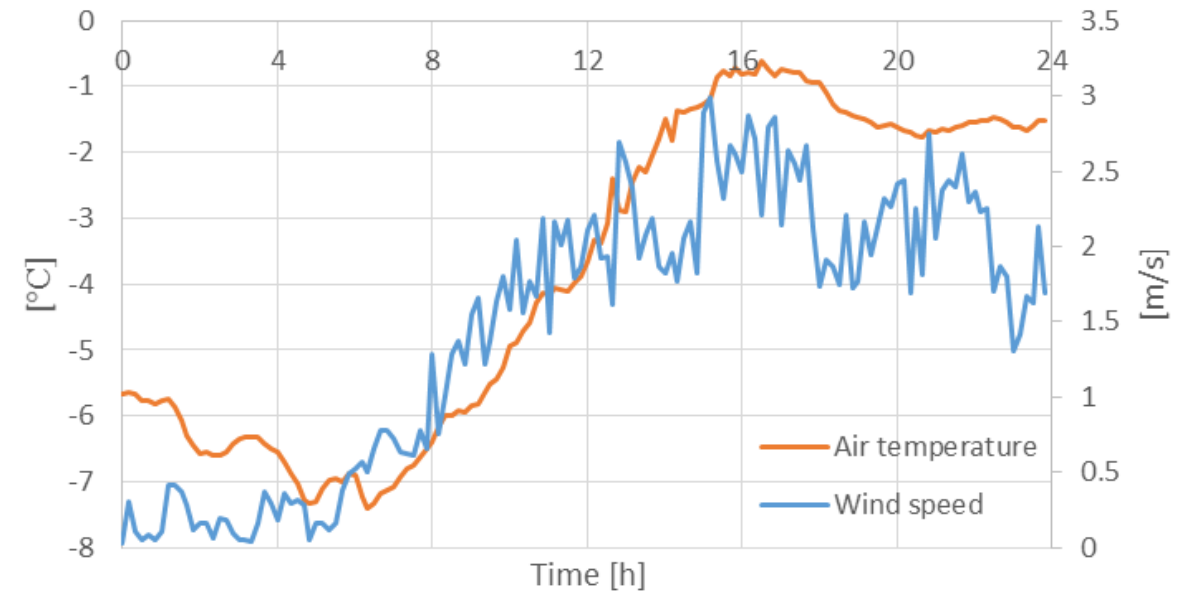
Monitoring of solar irradiance and meteorological conditions

12.03.2022

Global solar irradiance



Air temperature / Wind speed



Maintenance and testing

- Regular infield testing of systems:
 - Gossen Metrawatt Profitest PV



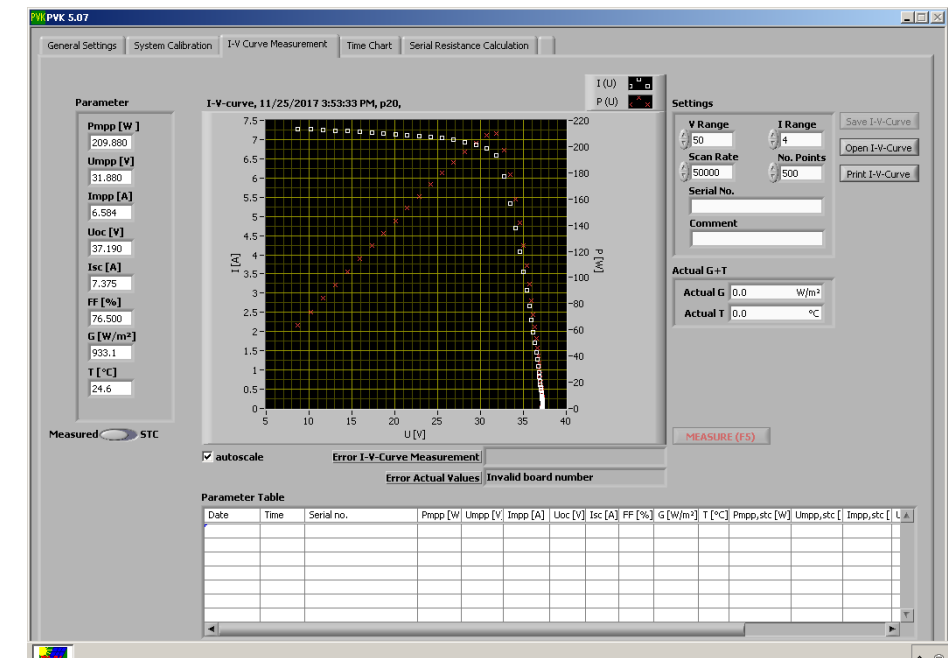
Maintenance and testing

- Regular infield testing of systems:
 - Horizontal solar simulator



Maintenance and testing

- Regular infield testing of systems:
 - Climatic chamber
 - Flash solar simulator (IMT SolarFlare)



Maintenance and testing

- Regular infield testing of systems:
 - Climatic chamber
 - Vertical solar simulator





Thank you!

