MINTENANCE AND EFFICIENCY MONITORING OF PHOTOVOLTAIC SYSTEMS

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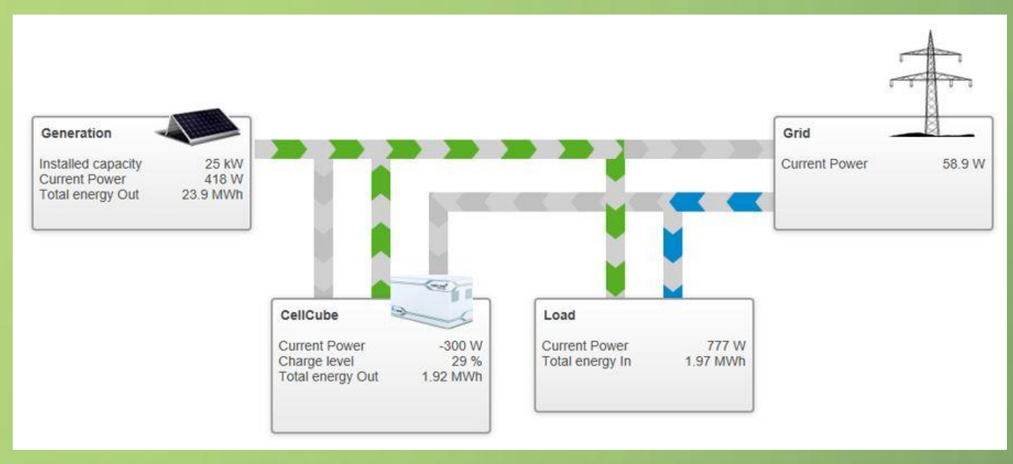
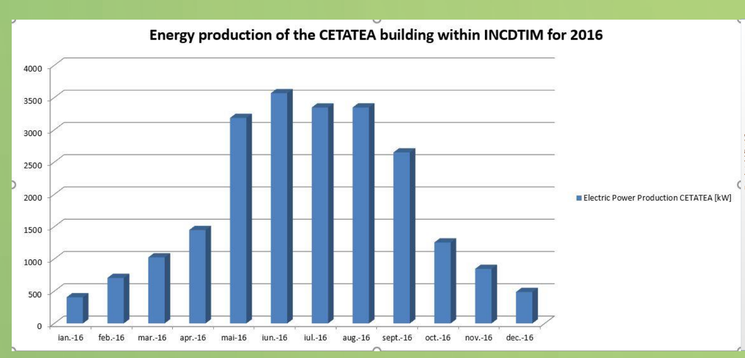
Abstract. Present study shows a multitude of internal and external parameters that affect the electricity production of a photovoltaic system. The energy production of the panels is influenced by several factors, such as the weather conditions, the positioning, the shading, the dust and the aging. To have an efficient system, maintenance is very important. This photovoltaic system is located within I.N.C.D.T.I.M. Cluj-Napoca, on the roof of the CETATEA building. It was financed by the Sectoral Operational Program " Increasing economic competitiveness ", Investments for your future and co-financed by the European Regional Development Fund..

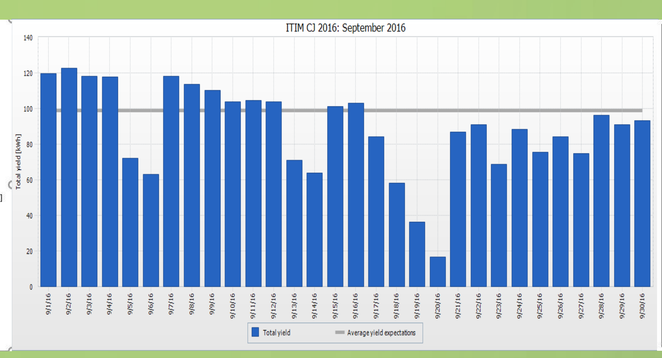
This photovoltaic system is located within the I.N.C.D.T.I.M. Cluj-Napoca, on the roof of the CETATEA building. The figure below shows the connection diagram of the system. This system is an island type, the maximum generated power is 25 kW, the battery has a storage capacity of 10 kW, the consumer is the department C.E.T.A.T.E.A.

PV systems have the major disadvantage that the output power is dependent on direct sunlight, so a significant amount is lost if a tracking system is not used, as the cell will not be directed directly at the sun at any time.

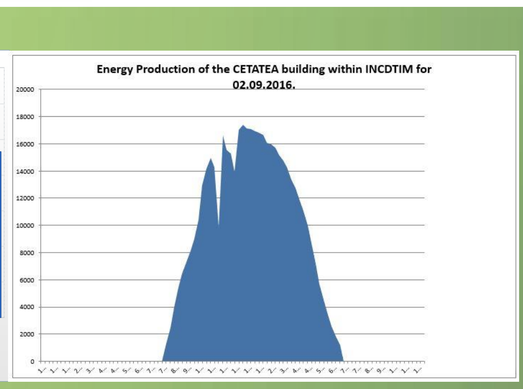




One year



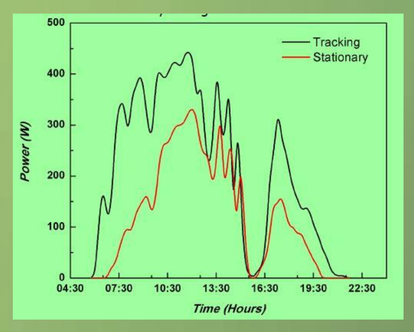
One month



One day

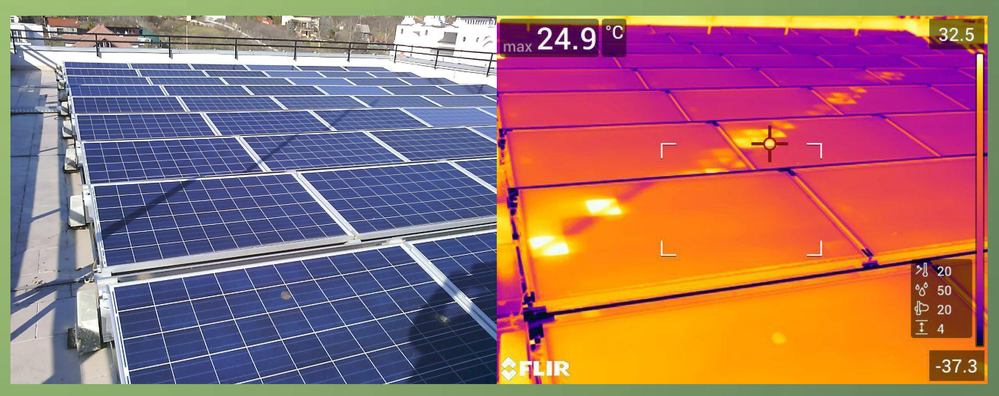
Stationary Panels
- 102 photovoltaic panels
- 245W each
- 20 ° from the horizontal
- southwest orientation 22 °

Tracking system
- 2 photovoltaic panels
- 245W each
- Two-axis tracking system
- Continuous movement

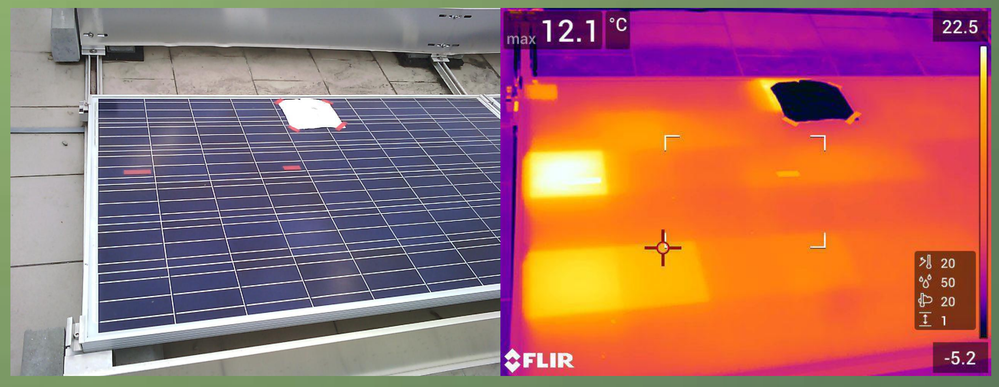


With the tracking system, energy efficiency increases by over 70%

The output of a cell declines when shaded by a tree branch, building or module dust. The output declines proportionally to the amount of shading. For completely opaque objects such as a leaf, the decline in current output of the cell is proportional to the amount of the cell that is obscured



An individual solar cell has an output of 0.5 V. Cells are connected in series in a module to increase the voltage. Since the cells are in series, the current has to be the same in each cell and shading one cell causes the current in the string of cells to fall to the level of the shaded cell. Typically, the module I_{SC} is reduced to the **lowest** I_{SC} of all the cells in a string.



Shading just one cell in a module to half causes the output power of the whole module to fall to half. No matter how many cells there are in the string, completely shading one cell causes the output power of the module to fall to zero. The lost output power of all the unshaded cells is dissipated in the shaded cell. It is even worse at the system level, where multiple modules are in series to increase the system voltage to 600 or 1000 V and shading one cell would affect the entire module string.

Conclusions: In order to have an efficient system, it is very important the angle of incidence with the sun, the degree of dust coverage, the shading to be as zero as possible.

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