ANALELE UNIVERSITĂȚII
"EFTIMIE MURGU" REȘIȚA
ANUL XVI, NR. 1, 2009, ISSN 1453 - 7397

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Performance of a Grid Connected Photovoltaic Plant

The paper presents an overwiev of the performances of the grid connected photovoltaik plant at the University "Eftimie Murgu" Resita, Romania realised on the monitoriesed wheather and installations data stored in a on-line data base during one year.

***Keywords**: grid connected photovoltaik plant, monitoring system, solar radiation, yield factor*

1. Introduction

The growth of domestic and large scale applications of photovoltaic, annual growth of more than 40% worldwide since 2000 shows that the technology has stepped out from demonstration phase into large-scale deployment, currently creating an emerging, challenging and innovative market [1].

To ensure the growth of the PV sector, further investigations are needed to give a certain level of security to such an investment. The main influence on the energy output, beside the system design, is the choice of the location and the accurate estimation of the energy generation potential [2]. The yield estimation has to be provided for all categories of PV systems, from small configuration of 1 – 5kW up to a multi MW system.

For such yield estimations [4] and depending on the purpose, different types of information's are required: long term historical data sets of the expected energy yield, real-time data sets on available energy resources, recent real-time and forecasted site specific irradiance, local solar resource characterisation and reliable estimate on the availability of solar irradiance, real-time data sets on weather and environmental conditions.

If we consider that system design and component behaviour are the most important factors in ensuring reaching a high performance ration (PR) the system energy yield will nevertheless be a function of the solar irradiation level at the installation site.

2. Grid connected photovoltaic plant and his monitoring system at the site Resita

To be able to make such yield estimation for the photovoltaic systems for the site Resita, with the possibility of extension for the entire South Banat region and extrapolate for the 45^0 latitude, in May 2008 an on-line monitoring system for the grid connected photovoltaic plant has been installed and put in function.

The system consists on the monitoring part of temperature and solar radiation sensors, Sunny Sensor Box, communication device with the PC, sensors, inverter and on the plant from four solar photovoltaic modules of MultiSol 175W type, connected in series and an Sunny Boy 1100 inverter.

The complete principle scheme, monitoring system and grid connected photovoltaic plant [3], is shown in figure 1.

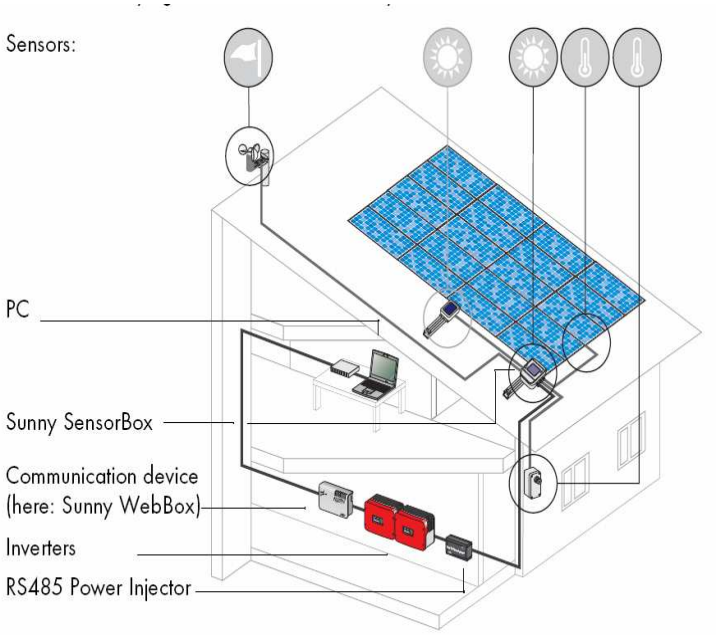

Figure 1. Complete scheme, grid connected photovoltaic plant and monitoring system

3. Analyse of the monitorised parameter with Sunnyportal

The web sunnyportal [6] offers an professional monitoring and a data storage of the yield, powers, earnings and weather conditions for the photovoltaik plant, figure 2.

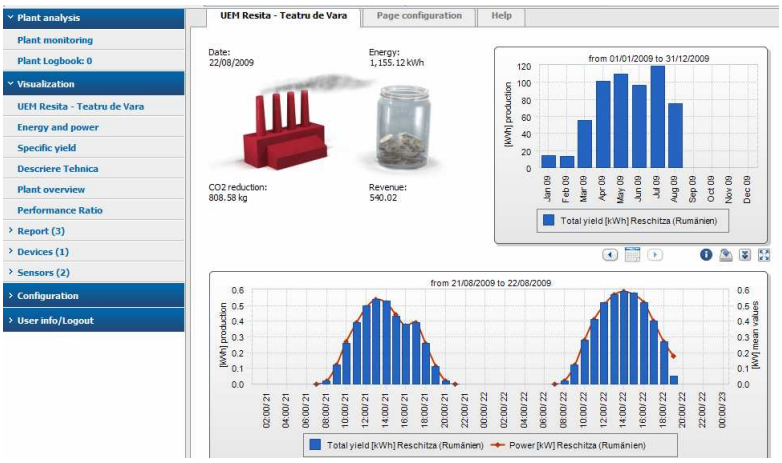

Figure 2. SMA Sunny portal for plant monitoring

The sunny sensor box registers the weather conditions, vital for the plant performance: solar radiation, with the same orientation and angle of inclination like those of the photovoltaic modules, module and ambient temperature. Figure 3, 4, 5 and 6 presents those values for spring, summer, autumn and winter 2008 / 2009.

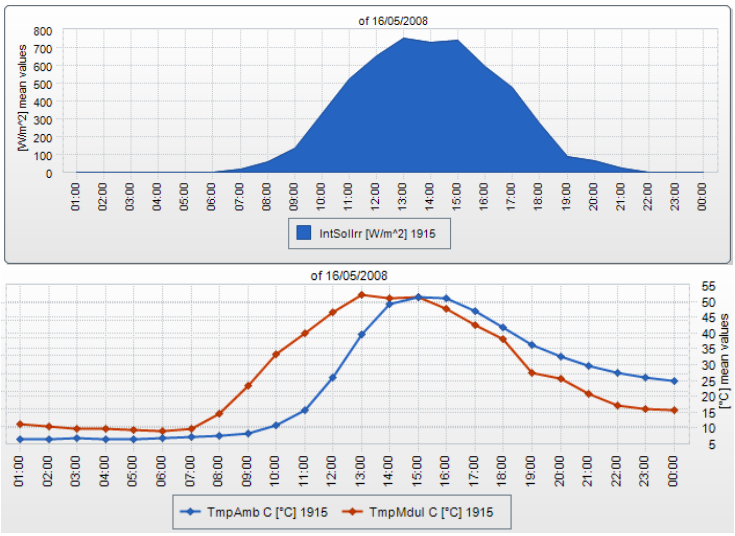

Figure 3. Solar radiation, ambient and module temperature, 16.05.2008

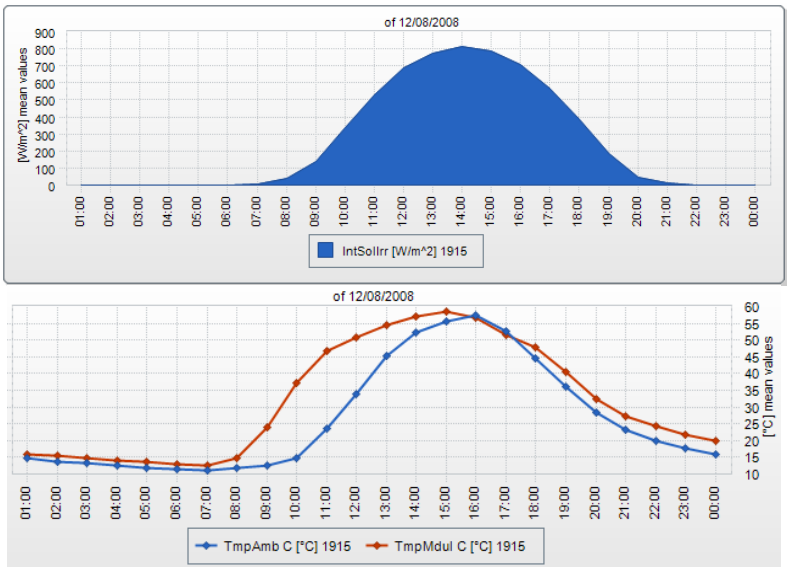

Figure 4. Solar radiation, ambient and module temperature, 12.08.2008

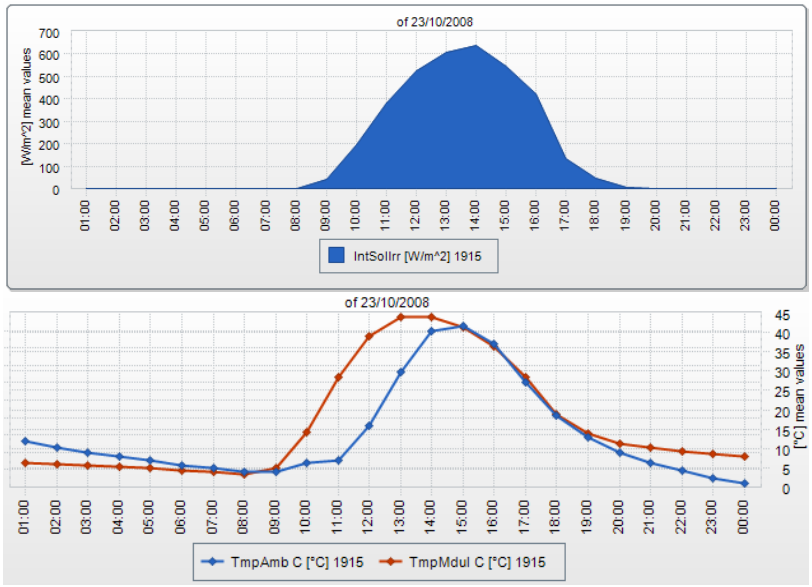

Figure 5. Solar radiation, ambient and module temperature, 23.10.2008

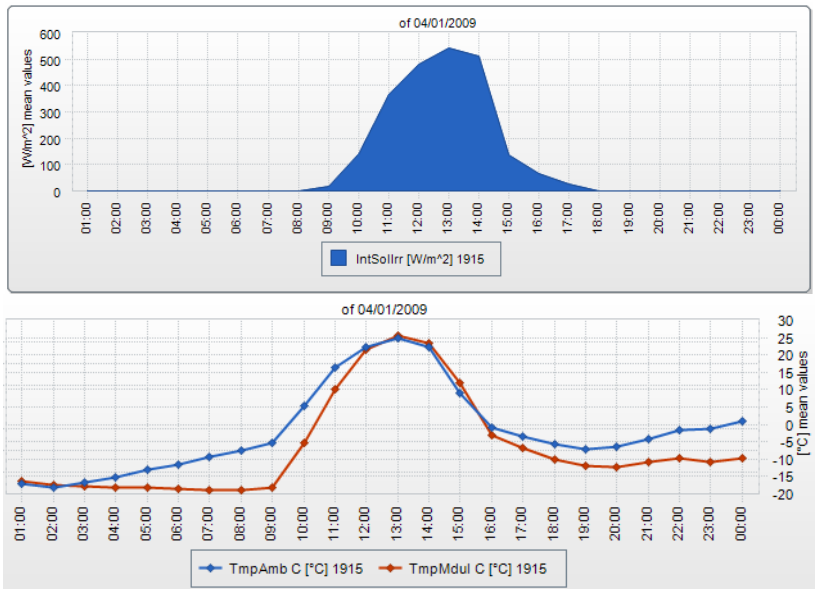

Figure 6. Solar radiation, ambient and module temperature, 04.01.2009

With those values, for the four seasons's the most significant have been chosen, the differences in the maximum value of the solar irradiation and the duration of the incident sunlight over a day are clearly outlined.

Based on this analyze, the total number of operating hours for the system has been computed on the monitoriesed period per day, figure 7.

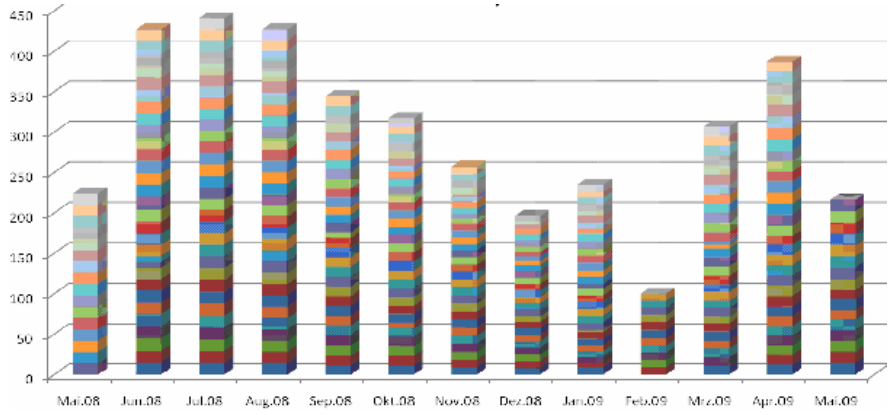

Figure 7. Total operating hours on days

4. Conclusions

From the present analyze results the adequate reliability of the solar photovoltaic system during the first year of operation, obtaining a large volume of data into a database that can be made available to potential users of such renewable energy sources and the expected time schedule of the systems operating. That information obtained on this system, working in real conditions, represents the fundament for economical cost calculations to estimate the investment deprecation and future technical adaptations to choose the right equipment.

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