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Solar Photovoltaic Plant for the "Eftimie Murgu" University of Resita

The paper presents an application of a solar photovoltaic plant for the "Eftimie Murgu" University, with an estimation of the yearly medium energy production. The substantiation of the plant design is based on the many years measurements obtained in the laboratory for monitoring the solar photovoltaic energy of the university and the favorable conditions of promoting the energy production from renewable sources, assured in the new legislation.

***Keywords**: solar photovoltaic conversion, solar module, inverter, motor - generator group*

1. Introduction

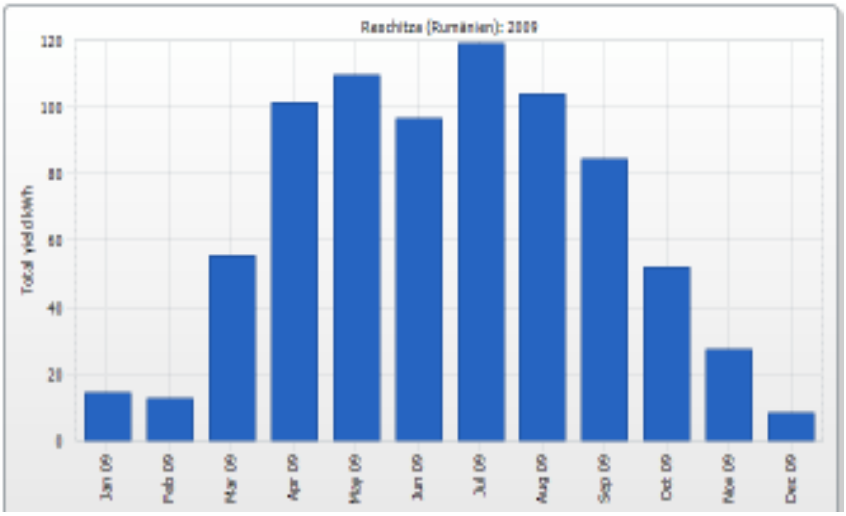
From the installation and commissioning of the photovoltaic modules, MultiSol type produced by Scheuten Solar, the parameters of the solar photovoltaic plant, produced power, energy, yield, earnings [2] and the meteorological influences, as outside and module temperature, solar radiation or wind, have been monitored in a professional manner [3] through an monitoring system formed by Sunny Web-Box, Sunny SensorBox and the Sunny Portal [7] that allows a free data storage, a corresponding overview and processing of those mentioned information.

In the period from 16.05.2008 when the solar photovoltaic power plant was connected to the public grid through a Sunny Boy Inverter, of type SB 1100, until 4.09.2010, this plant of the University has produced and injected in the network, energy of 1937 kWh.

In this operation period, a medium production of 0.39 kWh / m^2 * day of photovoltaic module has been registrated. This proves a geographic favorable position for the location Resita, respectively 45^0 N latitude and consequently for the whole area.

2. Solar photovoltaic plant for the 'Eftimie Murgu' University, Resita

The measurements highlights the differences between the electricity production, generated during periods of high insolation (spring / summer) and those with a lower insolation (autumn / winter) [1], for a whole year, 2009, figure 1.



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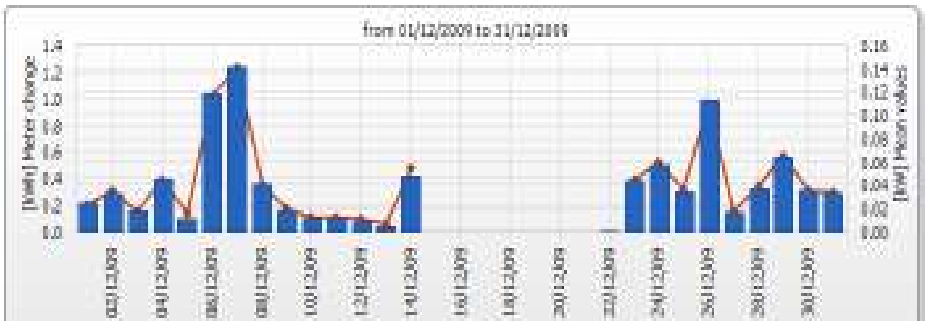
b.



c.

Figure 1. Electric power (line) and produced energy (bar) in: a. year 2009, b. July 2009 and c. December 2009

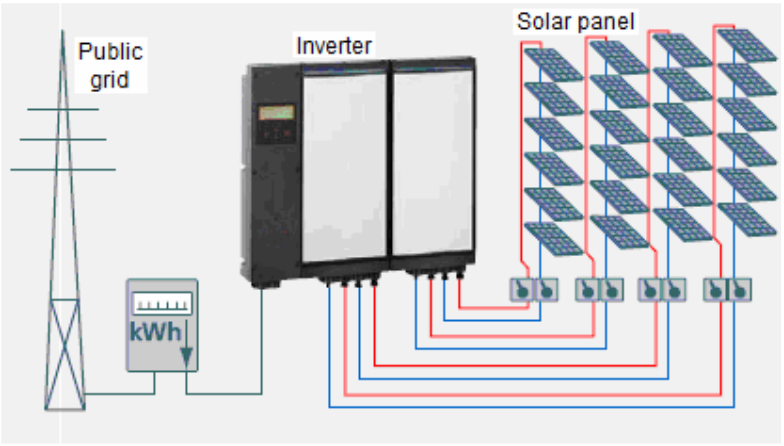
The orientation of the solar modules has to be focused on South, with an inclination angle to the horizontal of 30 – 35 degrees [5]. Considering the available roof area orientated to south of 60% of the total area, and a facing slope angle mentioned above, a surface of approximately 3000 sqm solar modules can be installed.

To ease the mounting of the solar modules, those will be fixed on metal frames, with air space beneath the roof of the building and will be faced to south, figure 2. This investment can be realized in different stages, depending on the available financing sources.

Figure 2. Settlement schemes of solar modules on the roof of the building

The operating principle of the modules is that of the photovoltaic cells, that convert light into electricity, electric charge been produced by photocell.

Based on the above mentioned dates, a medium annual energy production of about 430 MWh can be obtained. The generated electricity will be injected in the local network (220 / 380 V – 50Hz), through high efficiency inverters, figure 3.a, or through motor-generator groups, figure 3.b.



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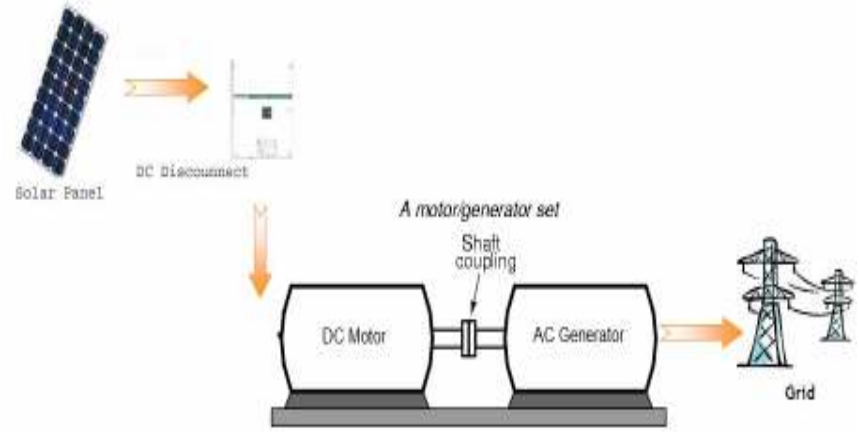

b.

Figure 3. Solar photovoltaic electric schemes with network connection: a) electronic inverter and b) motor / generator set

The presented solutions in figure 3.a, refers to the widespread with electronic inverter, but considering also the research character of this installation, it can be take in account the solution from figure 3.b, that uses a DC motor, directly fed from the solar generator coupled with a three phase synchronous generator that injects the energy in the grid.

In the analyzed period, an important aspect refers to that through this produced electricity, a quantity of 1,356.12 kg CO2 emissions have been avoided, figure 4. Based on this, through the possible installed PV capacity on the roofs of the Universities buildings, another quantity of approximate 298.000 kg CO2 discharged in the atmosphere could be yearly avoided.

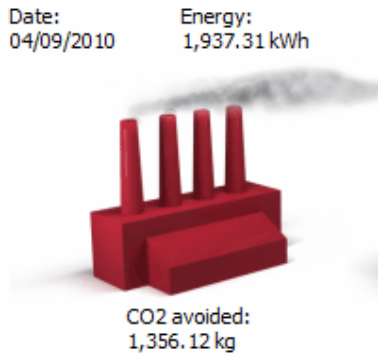

Figure 4. The avoided CO2 emission in the analyzed period

3. Conclusions

The implementation of the solar photovoltaic plant proposed in the paper, performs a triple role: first transform the university into an electricity producer, with a significant contribution to the institution's budget, secondly it avoids an important CO2 emission in the atmosphere and thirds this installation represents an opportunity for students and teachers to achieve effective teaching practices in the field of specialization.

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