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Experiences of a grid connected solar array energy production

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Solar energy possibilities of Hungary are higher than in Central Europe generally. The Institute for Land Utilisation, Technology and Regional Development of the University of Debrecen installed a photovoltaic (PV) system. The PV system is structured into 3 subsystems (fields). The first subsystem has 24 pieces of Kyocera KC 120 W type modules, the second subsystem has 72 pieces of Siemens ST 40W, and the remaining has 72 pieces of Dunasolar DS 40W In order to be operable independently of each other three inverter modules (SB 2500) had been installed.
The recorder can be connected directly to a desktop PC. Operating and meteorological dates are recorded by MS Excel every 15 minutes. The power plant is connected to a weather station, which contents a PT 100 type temperature and humidity combined measuring instrument, a CM 11 pyranometer, and a wind speed measuring instrument. The produced DC, and AC power, together with the produced energy are as well, and the efficiency can be determined for each used PV technology. The measured operating and meteorological dates are collected by Sunny Boy Control, produced by the SMA.
The energy productions of the subsystems are measured continually and the subsystems are measured separately. As an expected, the produced energy of polycrystalline -Si PV module and monocrystalline -Si PV was higher than amorphous-Si PV module. It is well known that energy analysis is more suitable for energy balance when we design a system.
The air temperature and the temperature of the panels and the global irradiation conditions were measured. In summertime the panel temperature reaches 60-80 degrees in a sunny day. The panel temperatures are in a spring sunny day approximately 30-40 degrees. It can be concluded that the global irradiation is a major impact feature to influence the amount of energy produced.
The efficiency depends on several parameters (spectral distribution of the incoming light, temperature values, etc.). The energy efficiency of a PV system in general can be defined as the ratio of the output energy of the system to the input energy received on the photovoltaic surface. As an expected, the energy efficiencies of polycrystalline -Si PV module and monocrystalline -Si PV was higher than amorphous-Si PV module. Based on our study, in general it can be concluded that the energy efficiency is lower than theoretical.