Off-grid systems sofia

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Our main partner isthe Netherlandish company Victron Energy, which isfamous for its reliable inverters, chargers and other professional equipment.Webuild ...

Atthe beginning of2021, the owner ofahouse under construction near Sofia addressedus toinstall asolar power plant onthe roof. Animportant criterion was uninterrupted power supply.

Inthe process ofnegotiations, westopped onahybrid system that can work both inparallel with the external grid and autonomously. The customer approved the design with the location ofphotovoltaic (PV) modules onall roof slopes.

Inmost cases, our clients avoid compromises and choose equipment ofthe highest level. Therefore, weused the time-tested solar modules from the Japanese company Sharp Solar. During installation, the customer had the pleasure towatch the process from abird’s height and kindly shared photos.

Atthe same time, our experience shows that ingloomy weather all the slopes ofthe roof «work» similarly, therefore, ifthere isasufficient budget, donot neglect the northeastern and northwestern slopes. Insunny weather, the use ofvarious roof slopes allows getting more uniform generation throughout the day from sunrise tosunset.

Apart from its direct purpose— converting solar energy into electrical— photovoltaic modules onthe roof ofthe house give their owners two pleasant bonuses: inhot weather, they significantly reduce the heating ofthe space under the roof, and during the rain they notedly minimize noise.

Photovoltaic modules produce direct current, and ineveryday life, asarule, alternating isrequired: 1-phased or3-phased. Inon-grid solar power plants (without batteries), the modules are connected tothe grid-tie PVinverter, which converts direct current into alternating. Inoff-grid and hybrid systems (with batteries), the modules are usually connected tosolar charge controllers orhybridPV inverters. Inour case, weconnected the solar modules tofive charge controllers and one grid-tie inverter.

For effective operation ofthe power plant, weused the charge controllers SmartSolar from the Netherland company Victron Energy. They lower the voltage obtained from the solar modules tothe level that isnecessary for the batteries, proportionally increasing the charging current. Battery inverters are responsible for converting direct current into alternating insuch systems.

Three charge controllers— MPPT 250/85. The first number inthe name ofthe modification means the maximum allowable voltage atthe input (from the solar modules)— nomore than 250volts. The second number shows the maximum possible current atthe output (tothe battery)— upto85amperes,

which atthe voltage ofthe battery, 55volts, provides acharging power ofabout 4.7 kW.

Toeach ofthose controller weconnected 12modules (blue inthe scheme), grouping them into 3strings of4modules. Solar modules ineach string are connected sequentially, which increases the total voltage ofastring. Between themselves, they are connected inparallel, which increases current strength. For the effective operation ofthe modules, all strings connected inparallel should bethe same and beinidentical conditions (azimuth, angle ofinclination, illumination, temperature).

Six modules weconnected toacharge controller MPPT 150/45 (also blue inthe scheme, 3strings with 2modules each) and another 16— tothe newest controller MPPT RS 450/100 (green inthe scheme). This was the first example RS 450/100, installed inBulgaria. The higher permissible voltage atthe input ofthis controller made itpossible tocombine sequentially eight modules ineach string. Inaddition, wewere able toplace two strings ondifferent roof slopes, since the modification RS 450/100 has two independent MPPT (Maximum Power Point Tracking).

The other 36modules (red inthe scheme) weconnected toa3-phased on-grid PVinverter Fronius Symo (Austria) with power of15 kW. Such acombination ofcharge controllers and angrid-tie inverter increases the overall efficiency ofthe hybrid system and deserves aseparate article.

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Web: https://www.hollanddutchtours.nl/contact-us/
Email: energystorage2000@gmail.com
WhatsApp: 8613816583346