



Geolux has installed a HydroStation monitoring system in Croatia, featuring a solar-powered, fully autonomous hydrological station with a 20 Ah LiFePO₄ battery, ensuring 30-day off-grid operation and real-time data transmission via HydroView.

Geolux has recently installed an automatic hydrological monitoring station at a location in Croatia. The monitoring station is based on a compact Geolux HydroStation system. It consists of a radar level sensor LX-80, a surface velocity radar RSS-2-300W, a HydroCam camera, SmartObserver datalogger, a 20 W solar panel, and a 20 Ah lithium-ion backup battery. All instruments use contactless methods for making measurements, and the equipment is mounted on a bridge over the waterway. The complete installation and setup procedure took less than 30 minutes on-site. The monitoring station was configured to measure water level and surface velocity every 15 minutes, while the attached camera was configured to take a photo every hour. The measured data is uploaded immediately to Geolux HydroView on-line service using a GPRS modem that is integrated with the SmartObserver datalogger.

Off-Grid Power Supply

Under normal operating conditions, a solar panel provides power to all instruments during the daytime, and the backup battery provides power during the night and under low-light conditions. The solar panel is large enough to provide sufficient power both for the operation of all instruments and for battery recharging. The battery charger circuit integrated into SmartObserver datalogger uses the MPPT technique to maximize power extraction, even when the solar panel is not exposed to direct sunlight. The backup battery that is used inside HydroStation was carefully selected to meet several requirements. The battery must have a high cycle life and lifespan to provide stable power over prolonged periods and to minimize maintenance costs. The battery should be safe to operate. The battery capacity must be sufficient to provide the power to the instruments and the data logger during longer periods when the solar panel is not producing electricity. After comparing and testing multiple different types of batteries, we have decided to use a lithium-ion battery - more specific, LiFePO₄ battery.

Battery Autonomy

The solar panel can stop producing electricity for a multitude of reasons. In Zagreb, where Geolux office is located, it is common to have thick clouds obscuring sunlight for a few weeks during the winter. Severe air pollution, fog, and smoke from wildfires also obstruct solar panels from producing electricity. Snow can accumulate on the solar panel for weeks and completely block the sunlight. And finally, the solar panel can fail, the cables between the solar panel and the battery charger can be ripped or torn, or the solar panel can be vandalized or stolen. The battery capacity was selected to ensure autonomous operation for at least 30 days, even without the solar panel attached. Having 30 days of battery autonomy is enough when the solar panel gets temporarily obstructed, and in case of complete failure of the solar panel, it gives enough time for the servicing team to arrive on location and repair or replace the solar panel. We have calculated that a battery with a capacity of 20 Ah can provide power for at least 30 days of operation of all instruments, with 15-minute readout intervals.

Running the Test

After installation of all equipment, we have decided to run an actual test of battery autonomy. The battery was fully charged before the test, and the solar panel was disconnected from the battery charger. We have continuously monitored the battery voltage over time. The test was run for 30 days. We have started the test on April 7th, with the battery voltage at 13.82 V, which corresponds to a 100% charge. The test was completed on May 7th, with the battery voltage measured at 12.86 V, which corresponds to 19% charge capacity. A 20 W solar panel was reconnected to the battery charger at 10:00 AM, and the battery was recharged back to the full capacity by the end of the day. After reviewing the test data, we have concluded that 20 Ah LiFePO4 battery comfortably supports the 30-day autonomy of a Geolux hydrological station. All instruments were operating correctly, even when the battery

