SURVEY ON A QUAD

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Renewable energy—including biomass, geothermal, hydroelectric, wind and solar—is big business in Italy. The country ranks among the world's largest producers of electricity from solar power. The photovoltaic (PV) solar sector has dramatically increased over the past five years, due in part to state incentives. Using PV modules located on the ground or on building facades and roofs, energy produced by the sun can be transformed into electrical energy. Installed PV power in the country is now approaching 17 GW, with about 475,000 installations, roughly 3 times the number in 2010.

In Italy, solar farms able to produce 1 MW or more of nominal power are considered "large." Before installing such a PV plant, an accurate topographical survey of the ground is required in order to establish the correct positioning and orientation of the PV modules, as well as provide the planners with a detailed description of the terrain.

SPECIAL CHALLENGES

In 2011, Siemens, Ltd., needed a topographical survey and stakeout of a site where a PV plant was to be constructed. The site extended over 180,000 m2 (44 acres) and was located close to Nepi, about 50 km (30 mi) from Rome. There were some special requirements for this project: The survey had to be done simultaneously with the plant's installation work (i.e., at the same time as the road network and fencing were

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created and where the pile drivers were being used). The client's main concern was to complete the survey as quickly as possible without compromising precision. Giuseppe Greco was commissioned to conduct the survey.

Greco, a surveyor with extensive experience, is known in Italy as an expert in surveying areas that are extensive and difficult to access. This is because he works with the help of a quad all-terrain vehicle (ATV), a Segway personal transporter and a personal electric robotic cart for moving his equipment. He is considered to be one of the few people who could execute a survey like that required in Nepi under the conditions stipulated by the client: as a one-man "team" (saving on manpower), working with speed and precision.

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THE SURVEY

Greco immediately realized that the survey would not be easy. Apart from the area's very uneven topography, he would also be dealing with rain, mud and poor visibility morning and evening, not to mention extreme temperatures capable of reaching 30°–40° C (86°–104° F) in the shade.

For the survey, Greco chose the Trimble R8 GNSS (as the base station and rover) and a Trimble S6 robotic total station, both using a Trimble TSC2 controller. He also used three prisms: a single prism for readings up to 2,500 m (8,202 ft), a triple prism for precision distances over 2,500 m, and a 360° prism for topographical surveys in robotic mode. During the survey, Greco relied primarily on the quad ATV for transportation; during stakeout, however, he mainly used the personal transporter, followed by the electric robotic cart with his supplies.

Greco started by performing the topo survey of site conditions, while simultaneously creating eight benchmarks in a circle, identified either by survey markers or milestones. During this phase, he used the Trimble R8 receiver: After setting up the GNSS base on the first benchmark, Greco installed the rover on the quad–appropriately equipped for transporting equipment–staking and surveying in real time. He chose the quad when it became

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clear that this part of the survey would involve significant height differences and numerous stops. This approach enabled Greco to complete the survey well within the planned timeframe.

STAKEOUT

The second phase involved staking out the site. Using the Trimble S6 robotic total station with a base set up on an intermediate benchmark, Greco employed the Trimble Integrated Survey (IS) rover, which consisted of a 2 m (6 ft) carbon rod with a 360-degree prism and the Trimble R8 rover on the top. This combination utilizes both GNSS and optical technologies, and enabled Greco to stakeout the site even without a GNSS signal, or when there was no direct line of sight to the robotic total station.

Moving about in the field during stakeout took place on the personal transporter, followed by the mobile supply robot. Using the quad ATV would have actually created a hindrance during stakeout. The vehicle's dimensions and turning radius would not have been suitable for stakeout work, where it was necessary to take many measurements very close to one another. The personal transporter was better adapted to the task, and the use of the electric robotic cart solved the problem of moving the equipment.

ALL ACCORDING TO PLAN

The survey was performed as outlined in the project planning stage. Both phases were executed quickly; in fact, the topo survey was carried out in just one day. After returning to the hotel, Greco downloaded the data, processed it and emailed it to the planners. Two days later the planners returned the file for stakeout, and the following day was spent creating the data to be staked. Three days were needed to stakeout the entire area; Greco set roughly 700 stakes for fences, roadways, structures and the PV equipment. A second pass, 10 days later, was needed to replace stakes that had been knocked down during construction.

Greco fulfilled the requirement of working concurrently with the construction activity, while completing the survey assignment quickly and with maximum precision. The Trimble instruments enabled him to carry out the surveying and checking phases in the field, speeding survey time and efficiently handling the massive amounts of data acquired. Greco completed an estimated 10 or more days of work in just four days—a good payback for using a unique transportation approach and Trimble Integrated Surveying technology.

Fulvio Bernardini is a freelance writer, translator and editor based in Italy.

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