Thermal Inspection of Solar Power Plants

Ecodrones Limited undertakes industrial drone-based thermal inspections, covering the full process from data acquisition to analytical reporting.

We are capable of programming precise flight paths for drones equipped with thermal cameras, ensuring that at each capture point the drone maintains a pre-set distance from the panels. This allows the system to follow terrain variations with centimeter-level accuracy. Using this method, we can guarantee consistent, high-resolution, and homogeneous imagery of every solar panel and any detected faults, which is essential for reliable post-processing and analytical evaluation. (Image 1.)

Our company operates one of the highest-resolution drone-based thermal camera systems currently available on the market (1280 × 1024 pixels).

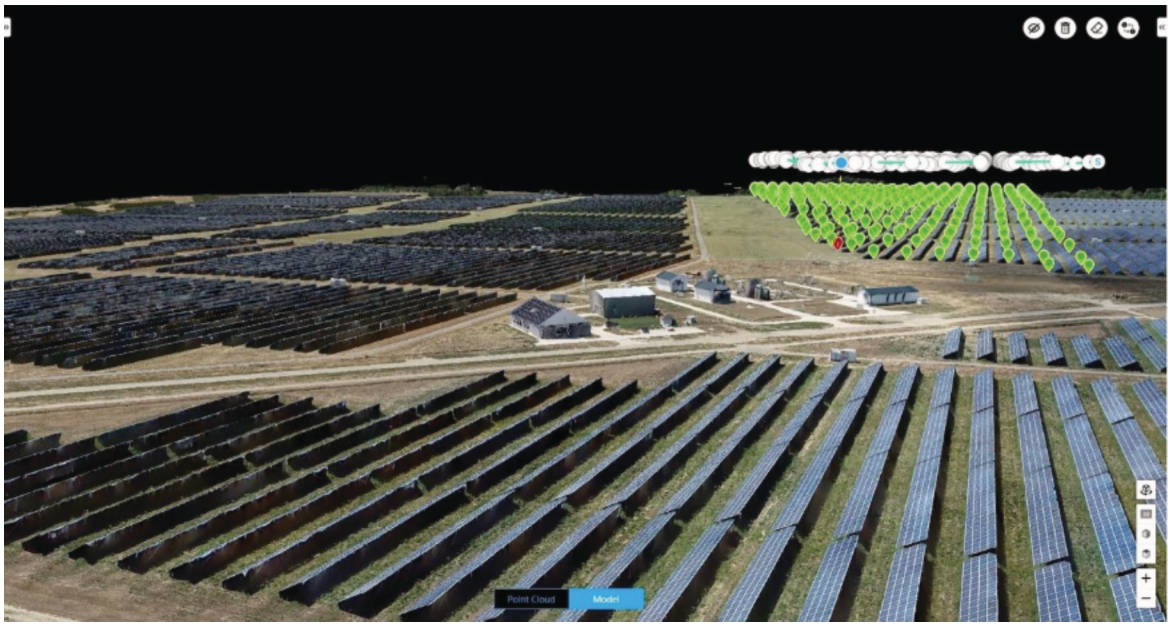

Image 1. A 3D model generated from the preliminary survey, showing the designated flight path segment prepared for the thermal inspec; on drone.

With the appropriate expertise and planning, and under optimal weather conditions, a 50 MW solar power plant can be surveyed within a single day. Conducting the same inspection manually with a handheld thermal camera would take one person an entire season. Furthermore, the precision of drone-based inspections — maintaining constant distance and angle of incidence relative to the panels — significantly exceeds the accuracy achievable with manual thermal imaging.

Each thermal image is accompanied by a high-resolution photograph in the visible (RGB) spectrum. This enables clear differentiation between cell faults or hotspots caused by vegetation, contamination, physical damage, or other external factors.

Using a proprietary technique developed by our company, detected faults are marked directly on the thermal images. These identified issues should subsequently be examined in detail with a handheld thermal camera. Thanks to drone-based data acquisition, the manual thermal inspection becomes highly targeted, as the exact location of faults and defective panels is known with centimeter-level accuracy. (Image 2.)

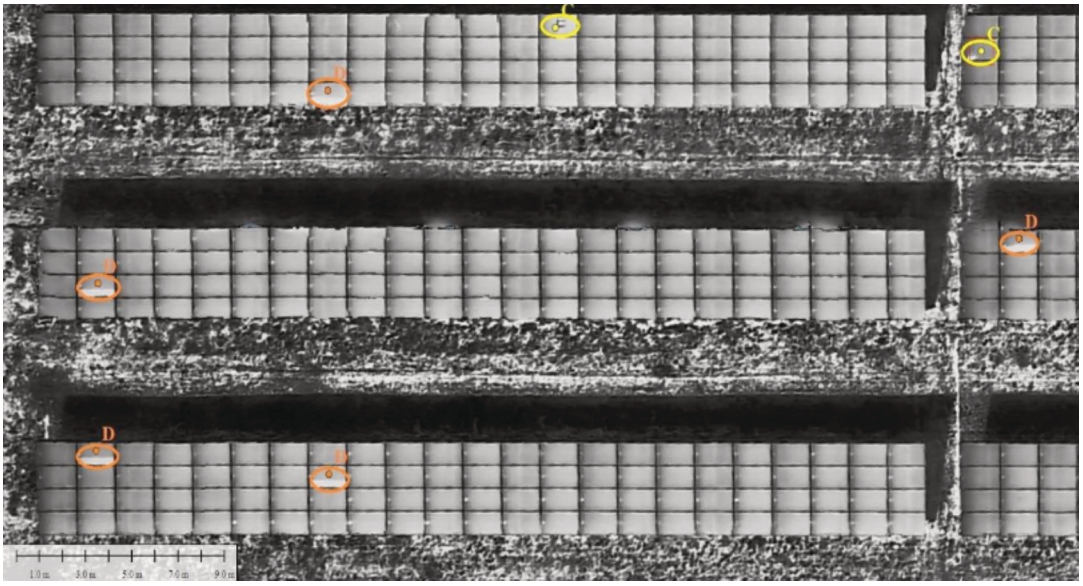

Image 2. Detail of a solar power plant showing diode and cell faults.

The full survey and analytical assessment of a 50 MW solar power plant — including delivery of all collected data — can be completed within one week under ideal weather conditions.

Upon completion of the analytical process, the entire dataset, including all raw data, is handed over to the client. If required, we also provide comprehensive raster and vector-based summary reports and analytical overviews. (Image 3.)

Image 3. Detail of the thermal fault detection results of a solar farm.

The key results of the analysis are delivered to each client in a user-friendly and easily interpretable format. To access the dataset, a free software (Google Earth) is required, which allows users to toggle different fault layers on or off and view the original thermal and RGB images associated with each detected fault with a single click. (Image 4.)

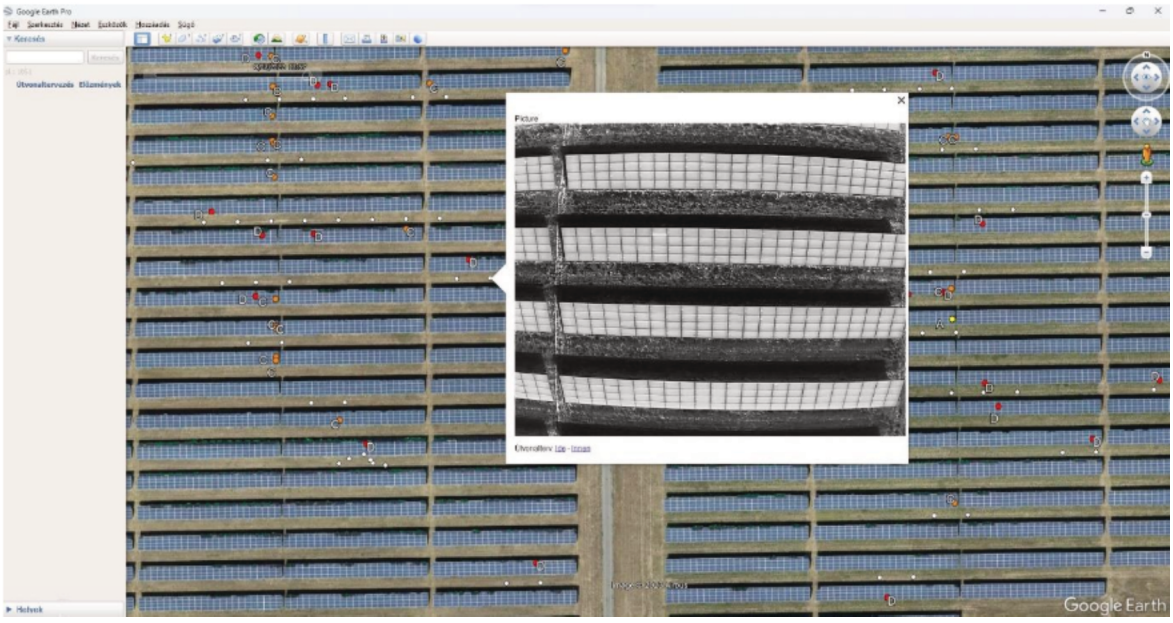

Image 4. Analytical results opened in the free Google Earth program.

Power losses caused by faulty cells or diodes can be clearly quantified, enabling significant improvements in the operational efficiency of the solar parks. Additionally, during project implementation, this system allows for the detection and quantification of warranty-related issues both before and after technical handover.