



PRODUCT APPLICATION NOTE

Solar Power Protection

Surge Protective Solutions for Photovoltaic Systems

The desire to find cleaner, more cost-efficient and safer power generation alternatives has led to increased construction of photovoltaic (PV) power plants world-wide. This trend will continue and as these new PV power plants come online, operators will be faced with many unknowns including long-term system reliability and maintenance levels needed. These concerns are further intensified for plants that are located in hard-to-access, remote areas.



Raycap's expertise in surge protective devices (SPDs) for photovoltaic power is built upon years of experience and strengthened by the development of a photovoltaic power plant adjacent to Raycap's manufacturing facility at Drama, Greece.

In this application note, key locations and solutions for optimum protection levels and maintenance-free surge protection are discussed.

The Challenge

A significant concern for PV power plant operators is equipment damage caused by direct or indirect lightning strikes. Damage from these overvoltage events can bring a PV installation offline for days or perhaps weeks, resulting in power interruption and revenue losses. To avoid the destructive effects of lightning strikes, overvoltage protection must be installed at various locations throughout the PV facility.

Raycap is committed to developing electrical protection solutions that eliminate downtime from lightning strikes and reduce stress to PV power plants caused by overvoltage.

To support this, the company invested in its own PV power plant which was completed in March 2011 on a 34,000 square meter site adjacent to Raycap's manufacturing facilities in Drama and is one of the largest installations in Northern Greece. The state-of-the-art facility is equipped with 18,200 high-efficiency thin-film solar panels and is capable of generating 1.4 megawatt of power. Two 800 kilowatt central inverters ensure effective, reliable power distribution to the grid.

The plant is expected to generate 2 million kilowatt hours yearly, while also serving as Raycap's photovoltaic testing facility.

Figure 1: Inverter section – typical installation

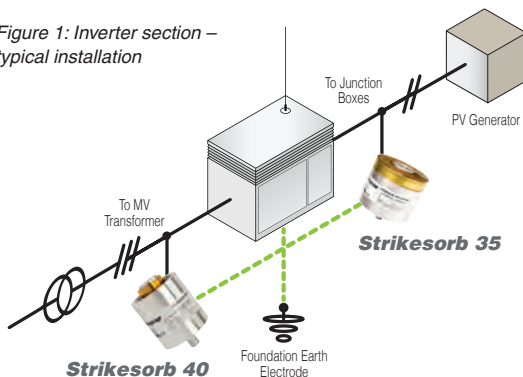


Figure 1 illustrates the highly recommended locations for lightning protection at a PV inverter. Two Strikesorb® modules (Class I/II) are installed at +DC and -DC to ground to protect the inverter against lightning strikes that create surge currents on DC lines. Additional Strikesorb modules are installed in the AC section of the inverter to protect against surges, spikes and other overvoltage events generated on the grid.

Raycap

INNOVATING POWER PROTECTION WORLDWIDE



Surge protection of power & monitoring lines

Raycap's lightning protection solution for photovoltaic applications are based on its unique Strikesorb® surge protection device (SPD) technology. Strikesorb SPDs provide safe, uninterrupted protection without requiring maintenance. Strikesorb's unique characteristics include: no fuses or thermal disconnects, no parallel metal oxide varistors or silicon avalanche diodes, low clamping voltage, no device aging, capability of absorbing multiple lightning strikes without failing, and an industry-leading 10 year warranty.

For its PV facility, Raycap designed a special purpose PV terminal box to protect the monitoring section of the central inverter and installed it near the inverter. See Figure 3.

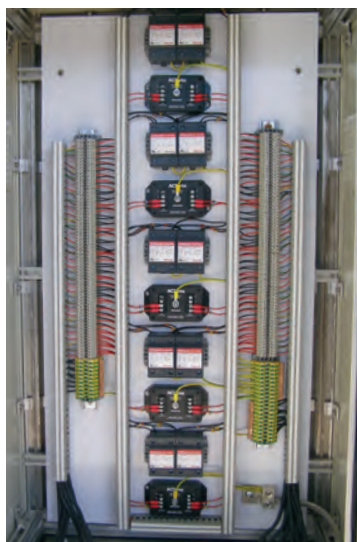
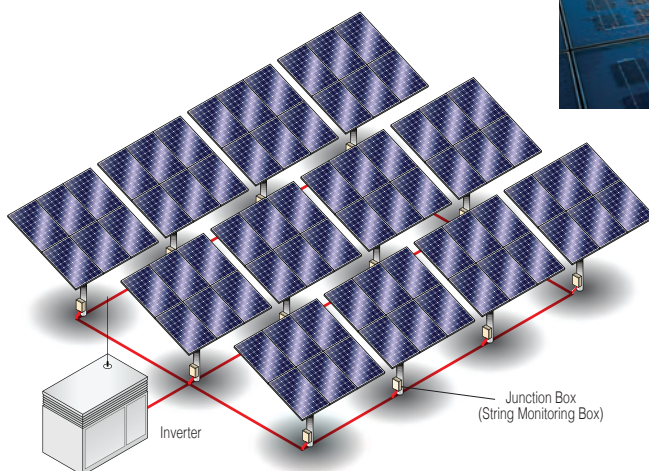


Figure 3: Inside this special purpose PV terminal box, ten Strikesorb DRM 30-V1-HV SPDs are used to protect several DC power supplies, and five modules of Raycap's ACData TJ1010B are installed to protect the data lines at the central inverter.



Figure 2:
Junction box
installation



Junction box installation

As illustrated in Figure 2, Strikesorb surge protection is installed in every junction box at the Drama site to prevent damage to the PV modules during surge events.

Intelligent string monitoring is part of every state-of-the-art photovoltaic power plant. Printed circuit boards (PCBs) are integrated inside the junction boxes and connected by cables directly to the inverter or a control cabinet. Strikesorb 30 or 40 modules are deployed in every junction box to protect the string monitoring units from the DC power supply. In addition, Raycap ACData® TJ1010B modules are used to protect the sensitive electronics equipment from surges on the data lines.

At the Drama PV park both inverters and junction boxes were designed and built by the manufacturers with Strikesorb pre-installed, so no modification was necessary in the field.

Conclusion

The system engineered by Raycap in conjunction with its electrical contractor for the Raycap PV facility in Drama is an example of a well-designed and executed solution to a problem that is of great importance to developers of photovoltaic power plants worldwide.



Strikesorb Benefits

- Maintenance-free operation
- Safe operation: No smoke, fire or explosion
- Unique capability to withstand multiple high-energy transients
- Low let-through voltage, therefore providing excellent protection compared with competitive SPD products
- Class I/Class II compliant SPD per IEC 61643-11
- Strikesorb 35 is a Class I SPD per the new EN 50539-11 standard for surge protective devices in PV applications and can be used in DC systems of operating voltages up to 1500V
- Global standards compliance: UL 1449 5th Edition, IEC, IEEE, NEMA
- 10 year global product warranty

Raycap is a trusted partner, providing maintenance-free electrical protection solutions for mission-critical applications in hundreds of thousand installations worldwide. For a detailed presentation on how Raycap's Strikesorb-based PV solutions can be implemented to protect your solar operations, contact us today!

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