Surge Protection for Photovoltaic Systems
Many of today’s economical and ecological building owners are installing photovoltaic (PV) power systems at their facilities. These installations can range from small supplemental power systems to large primary power sources. In many cases, the replacement cost of equipment and the cost of system downtime caused by power surges necessitates a robust surge protection scheme.

PV systems must be protected in two directions. First, the building must be protected from the surges that originate at or are enhanced by the PV system. Second, but equally important, the PV system must be protected from surges that are produced or propagated by the building’s electrical system. For these reasons, surge protection is recommended at a minimum of five points within a building based PV system. Remember that critical equipment connected by over 30 feet of cabling should have an SPD on both ends of the line.

1. DC Protection at the Input to the Inverter
   The inverter is one of the most expensive and fragile components of a PV system, and it must be protected from electrical surges originating at the solar panels or from within the feeder cables. If the combiner box and inverter are more than 30 feet apart than an SPD is recommended at both ends of the run.

2. AC Protection at the Output of the Inverter
   To protect the inverter from surges originating in the facility, an SPD is highly recommended on the output or AC side of the inverter.

3. Service Entrance Protection
   A high percentage of surges originate from utility power. To protect the entire facility and the PV system, a service entrance SPD is essential. Per UL1449 3rd Edition, this SPD should be a UL Type 1 listed device installed on the line side of the main disconnect.

4. Secondary and Point of Use SPD’s
   Under normal operation, motors, pumps, and fluorescent lights can cause electrical disturbances that can damage the building’s electrical infrastructure. Prudent building managers use point-of-use SPD’s to keep these locally generated disturbances from harming other devices attached to the system. A Type 2 SPD is the ideal solution for this application.

5. Dataline Protection
   Power surges can travel along datalines as easily as power lines, therefore datalines must be protected from transmitting damaging surges by using the appropriate SPD. This can include traditional serial based and ethernet based datalines.
Utility-Scale Solar Power Plants

Photovoltaic power generation fields are rapidly being deployed throughout the landscape. In many cases, the excess power they produce is fed back onto the local power grid. Whether tied to the grid or a standalone system, surge protection must be considered as part of a well designed installation. Due to their remote nature, PV power generation fields are both more exposed to lightning induced surges and are typically unmanned which requires a more robust and low maintenance design.

A well designed scheme includes protection for the solar panels, the input and the output of the inverter, the connection to the grid, and all of the networking that supports the system’s operation.

1. DC Protection at the Combiner Box
   The combiner box is the ideal location for the first tier of protection. A correctly sized SPD can divert surges before they impact the switching function of the combiner box and prevent the surge from propagating down stream.

2. Dataline Protection
   Power surges can travel along datalines as easily as power lines, therefore datalines must be protected from transmitting damaging surges by using the appropriate SPD. This includes traditional serial based and ethernet based datalines.

3. DC Protection for the Input to the Inverter
   PV fields utilize long cable runs to connect the panel sections to the main inverter. These cable runs are susceptible to ground based surges and direct lightning strikes, and can also transmit surges from the panel structures in the field. A robust SPD will protect the expensive and fragile components of the inverter system.

4. AC Protection for the Output of the Inverter
   This is the first line of defense for your solar field. A robust SPD is essential to protect the inverter from surges originating from the grid or power storage system and protect the grid from surges originating in the field.