



An Investigation into the Effects of Lightning-induced Transients on the Degradation of PV Modules Performance

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Abstract— Photovoltaic (PV) systems are vulnerable to direct and indirect lightning strikes, which are the major source of failure in these systems. Since the economic viability of PV systems depends on maintaining minimum efficiency levels of PV modules over a reasonable and predefined period, it is necessary to know if lightning-induced voltages of low magnitude, lower than the maximum Surge Withstand Capability (SWC), can change the electrical characteristics of PV modules. This research aims to investigate if, due to their cumulative effect over time, differential-mode transient overvoltage caused by indirect strokes can change the electrical characteristics of PV modules. After an initial assessment of the PV modules' state, various series of differential mode voltage impulses of different magnitudes were applied. Some PV modules were equipped with bypass diodes, and some were not. The I-V curves of the PV modules were obtained before and after each application series. The results did not reveal modifications in the electrical parameters of the PV modules caused by the application of differential mode voltage impulses. The modules maintain their efficiency and capability of supplying the same power even in the case of a failure of the bypass diodes.

Keywords— lightning, PV modules, PV efficiency.