

## PHOTOVOLTAIC SOILING AND MITIGATION BY ELECTRODYNAMIC DUST SHIELD

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There are major plans to build solar photovoltaic (PV) power plants in regions with abundant solar irradiation, where there are also high airborne dust concentrations. In these regions, PV soiling due to dust accumulation on solar panels could reduce the electricity output by 15-20% every month. Research is under way to understand PV soiling and to find solutions to mitigate dust accumulation on the solar panels. There is complex correlation between PV soiling and ambient dust concentration, wind speed, and relative humidity. First-principles models for such correlation are very difficult to build, but other modeling approaches such as artificial neural network may be feasible alternatives. We have also obtained information of physicochemical properties of the dust accumulated on PV modules, and found calcium, silicon, iron, magnesium, aluminum to be the dominant elements, and calcite, dolomite, quartz to be the dominant minerals. In addition, we have developed electrodynamic dust shield (EDS) prototypes and obtained laboratory test results. The dust removal efficiency of the EDS shows a downward trend with decreasing dust mass loading, and the central region between electrodes had the lowest dust removal efficiency. Using higher voltage will increase the dust removal efficiency, but it is limited by the capacity of the high voltage source and the dielectric strength of the EDS. Future research focus will be on improving the efficiency at low dust mass loading and improving the uniformity of dust removal.