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A case study on monitoring PID recovery on Multicrystalline modules

Potential Induced Degradation (PID) causes a significant decrease in a module's performance and durability over its lifetime of 20-25 years. PID occurs when a potential difference between the cells and the aluminium frame cause ions to flow to the surface of the cell resulting in a leakage current. In large solar PV power plant several modules are connected in series to give desired output of between 700 to 1000 V. If earthing is not done properly a potential difference equivalent to system voltage may develop between cells and the module frame, this provides enough electric field that may cause sodium ions to migrate from the glass through to the surface of the cell into the PN junction. The polarization causes heavy shunting on individual cells resulting in decreased shunt resistance (Rsh) and increased series resistance. Environmental factors such as high humidity and increased temperature worsen the PID situation. In this work PID was induced in a module by biasing the frame of the module to positive while the negative terminal was connected to the shorted terminals of the module. The effects of this induced PID are partly reversible. The module can be left to recover naturally or a reverse polarization recovery mechanism can be applied. This paper discusses the measurement and analysis of the extent of module recovery using Electroluminescence (EL) imaging, Dark Current-Voltage (I-V) measurements and power measurements carried out before and after PID induction and at regular intervals during recovery. This shows that minor PID effects can be reversed either through natural recovery or through the application of a reverse bias. The reason for better recovery naturally may be associated with natural diffusion of sodium ions away from the cell surface and from within the PN junction defect regions. The practice of "resting" modules or changing positions of modules in a string may be advisable to manage the PID problem.

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yes

Level for award
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PhD

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