Predicting performance of PV modules with differing UV absorbers undergoing UV-induced degradation

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Abstract:

Modern cell designs are sensitive to UV-induced degradation. This is attributable to reduced or eliminated front and back surface fields and increased dependence on high quality surface passivation of the cell that may degrade under UV irradiation. Loss of hydrogen passivation, hot carriers, and changes to surface states have been given as mechanisms. Cell parameters (V_{oc}, I_{sc}) degrading under UV irradiation were extrapolated to 50 y using a transformation of the independent variable ($W \cdot h/m^2$) to obtain a linear model. These results implemented in the Solar Advisor Model (SAM) show appropriate filtering of UV-irradiation can improve the energy delivered over time, and accordingly, the levelized cost of electricity and the net present value of the PV plant. Some advanced cell types are seen to be more UV-resistant indicating cell level solutions exist in addition to UV mitigation with glass and encapsulant.

About the speaker (Peter Hacke):

After a PhD in materials science from North Carolina State University, he worked on GaN LED and laser diode materials at Nagoya University, AIST, and Fujitsu in Japan. He started work in c-Si PV cell and module startups starting in 2000 and moved to NREL in 2009 and initiated the NREL work on IEC standards in PV module and inverter reliability.