Mitigate Degradation through Advanced Manufacturing

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PERC mono c-Si and Degradation

• Natural degradation due to aging

• Potential Induced Degradation (PID)

• Light Induced Degradation (LID):
  Well known effect, impacting in the first several hours of the testing
  Known mechanisms: Mainly due to Boron Oxygen complex formation (BO LID)

• Light and elevated Temperature Induced Degradation (LeTID):
  Occurs at elevated temperatures > 50°C under illumination
  Slower degradation rate, followed by a much slower recovery
  Unknown mechanisms: Possibly due to hydrogen diffusion in the bulk or hydrogen related defect activation
Solutions

Hydrogenation (2017)
Gallium doping (2020)

Ga doped P type mono wafer effectively eliminate LID and LeTID

Source: LONGi Whitepaper
Solutions

BOM selection

- Select and verify material combination (BOM) through sophisticated process
- Internal and 3rd-party testing (standard, and accelerated long sequential)
- 3rd party LID and LeTID test
Solutions

Optimize manufacturing process
Sample, test and monitor regularly

![Graph showing daily mono PERC cell LID/LeTID monitoring (at 80C)]

![Bar chart showing Module LeTID Measurement]

LONGi internal LeTID test at 75C
Solutions

Outdoor performance tracking and monitoring

pv magazine test

Systems being monitored around the globe