

DuraMAT Capability 5 Field Deployment for Reliability

Bruce King

DuraMAT Fall Workshop

August 28-30, 2018



Energy Materials Network
U.S. Department of Energy



Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

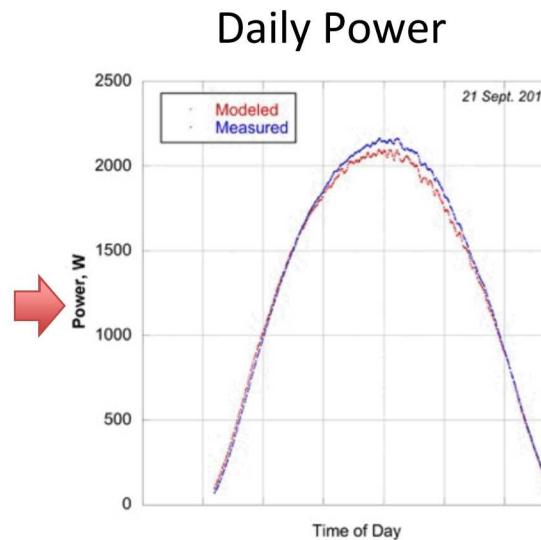


SLAC NATIONAL
ACCELERATOR
LABORATORY

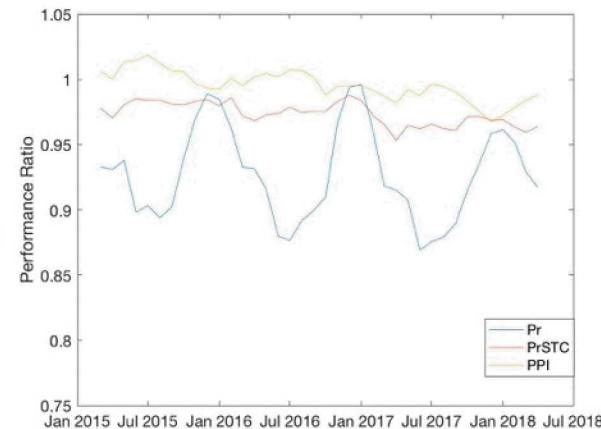
Brief Outline

- Field Deployment Capability Overview
- Capability Development Project: Non-Destructive Field Evaluation

Fielded PV Systems Research



Year-over-year
Performance Trends



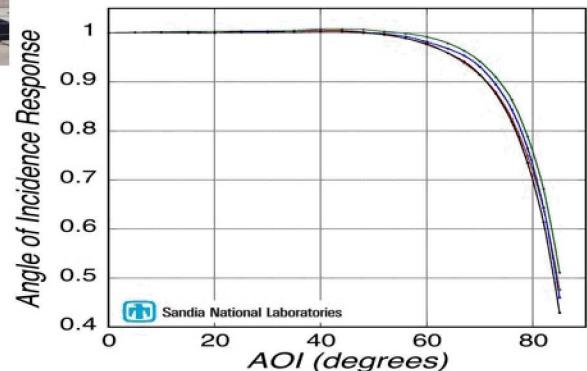
- Tracker Testing - Full electrical performance (IV curves, temperature coefficients, angle of incidence)
- System Instrumentation - DC Voltage and Current, In-situ IV curves, local irradiance
- Combine measured PV system performance with modeled power predictions
 - Evaluate system reliability and degradation rates
 - Evaluate technology improvements
 - Validate energy yield calculations

Emerging Technologies Characterization Examples

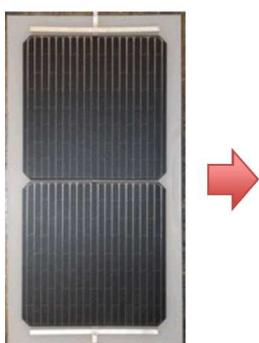
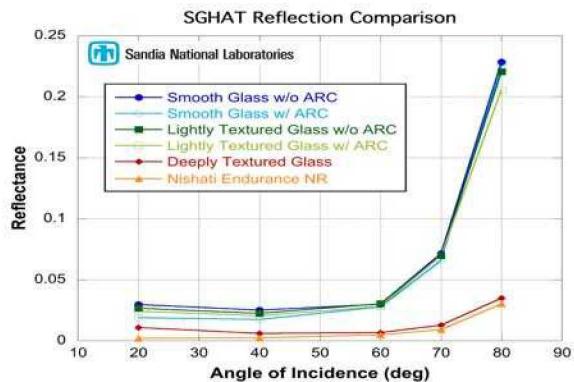
Roofing Products - BIPV



Angle of Incidence - Effect of Different Coatings



Optimization of Novel Packaging Methods



Component Research

Anti-soiling/anti-reflective coatings

DuraMAT BAPVC Project – CUNY/NREL
(late Q4 – FY18)

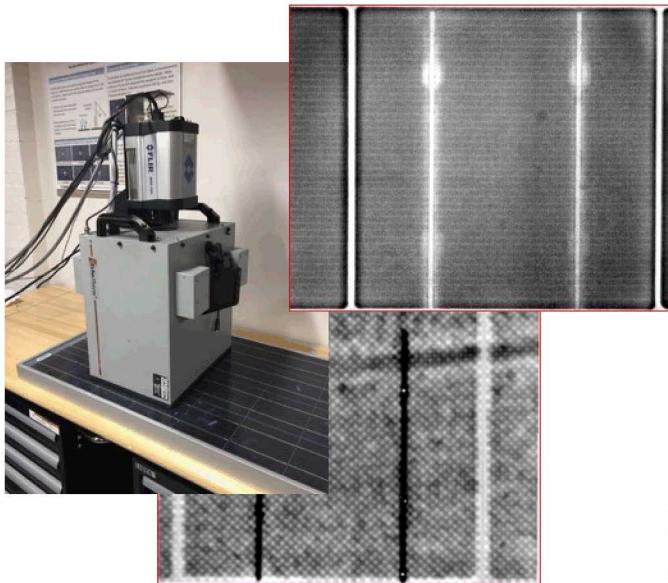


Connector Reliability Study



- 1-month to multi-year installations
- Evaluate materials and component reliability and degradation rates
- Flexible, stand-alone platforms at any orientation
- Two-axis tracker installations for maximum sun exposure
- Supported by comprehensive weather data
 - Irradiance, spectrum, temperature, humidity, etc.

Non-destructive fielded module evaluation capabilities



Field Electroluminescence



- Acquired fieldable EL camera from Brightspot Automation (7/18)

Flash Thermography

- Cells, gridlines, bus bars are easily visible
- Difficult to image thin-film modules
- Equipment is not easily portable, not sized well for full-size modules, throughput is low.
- No further work planned

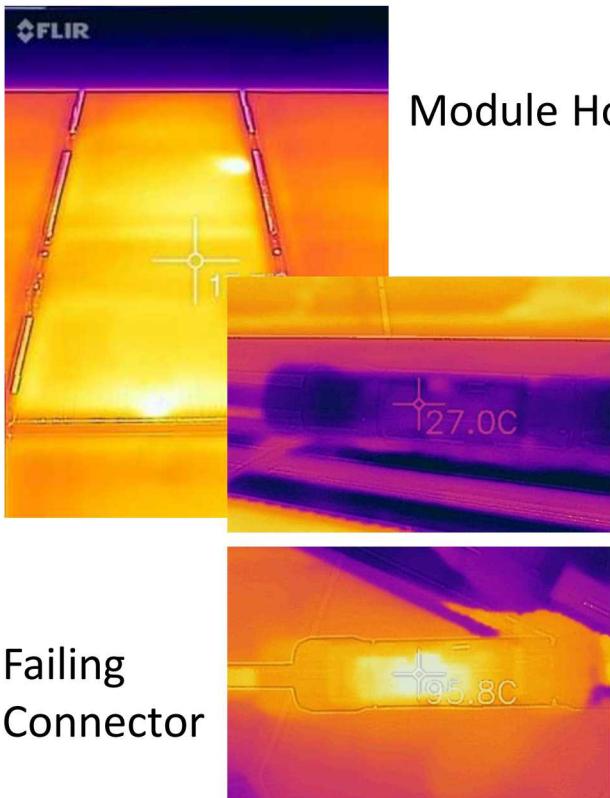
Field LED Flash Tester

- LED simulator for in situ IV characterization
- Full-size, up to 72-cell modules
- AAA
- 30 m/s pulse
- Expected delivery FY19



Non-destructive fielded module evaluation capabilities

Infrared (IR) Imaging (existing capability)



- FLIR A6700 Mid-Wave IR camera for high end inspection (1 - 5 μ m)
- FLIR One Long-Wave IR for quick inspection (8 – 14 μ m)

Additional Capabilities under consideration:

- Hand-held FTIR (commercial)
- Flash UV imaging (not well developed)