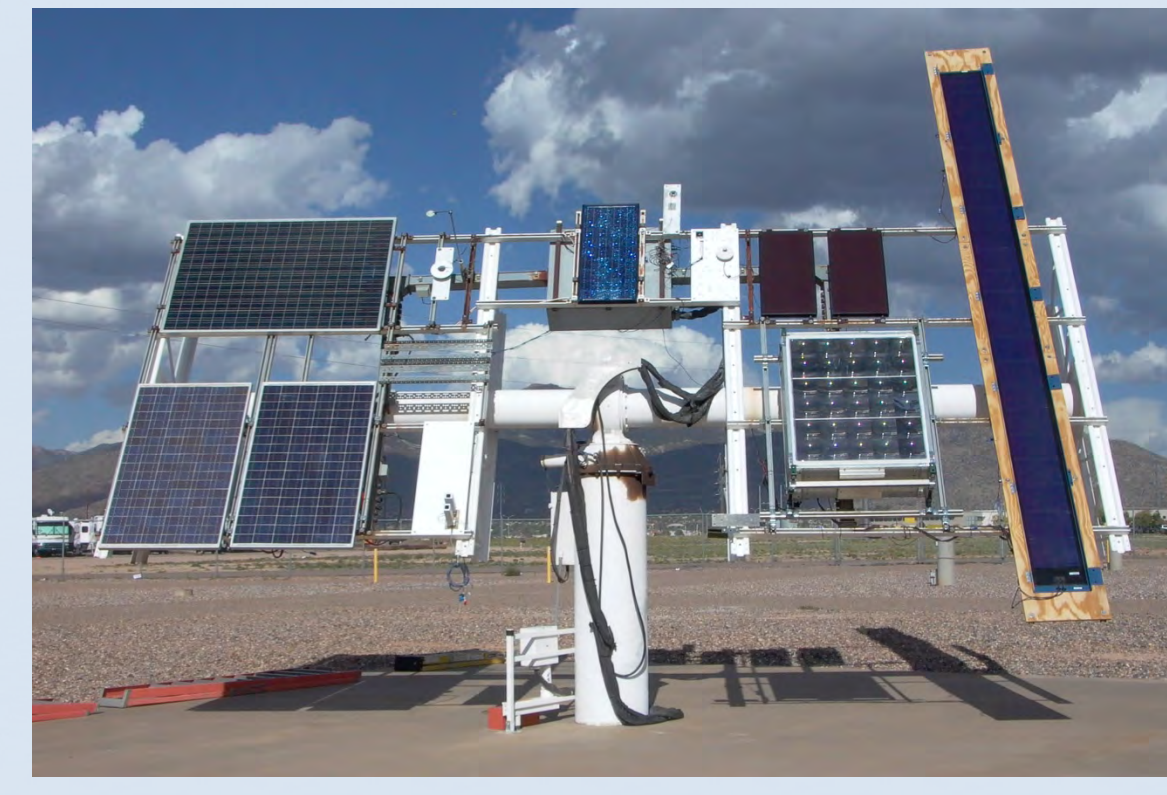


### Abstract

Field deployment is a key aspect of confirming the durability of new module materials and module designs. Field deployment validates the results of *Accelerated Module Testing (Capability 4)* by confirming the field relevance of degradation mechanisms and acceleration factors. These considerations are particularly important in demonstrating the bankability of either newly developed or known materials that are being used in a new environment, such as those identified by *Predictive Simulation (Capability 2)* and *Materials Discovery (Capability 3)* and facilitate technology transfer, commercialization, and market success for the most promising materials.



### Linking Outdoor Performance with Laboratory Diagnostics



#### Outdoor Capabilities

- Two fully programmable Two-Axis trackers
- Large, flexible mounting surfaces
- Single cell packages to full scale modules, complicated form factors
- Full electrical performance (IV curves, temperature coefficients, angle of incidence)

#### Indoor Module Lab

- Industry standard AAA 1-sun flash tester
- Custom Electroluminescence (EL) enclosure, mini-modules to full-size
- Temperature controlled light-soaking chamber, integrated IV sweep capability

#### Cell and Device Lab

- Reflectance and transmission measurements, Cary Spectrophotometer
- Solar cell spectral response/quantum efficiency measurements
- 2 1-sun cell testers

### Project Synergies

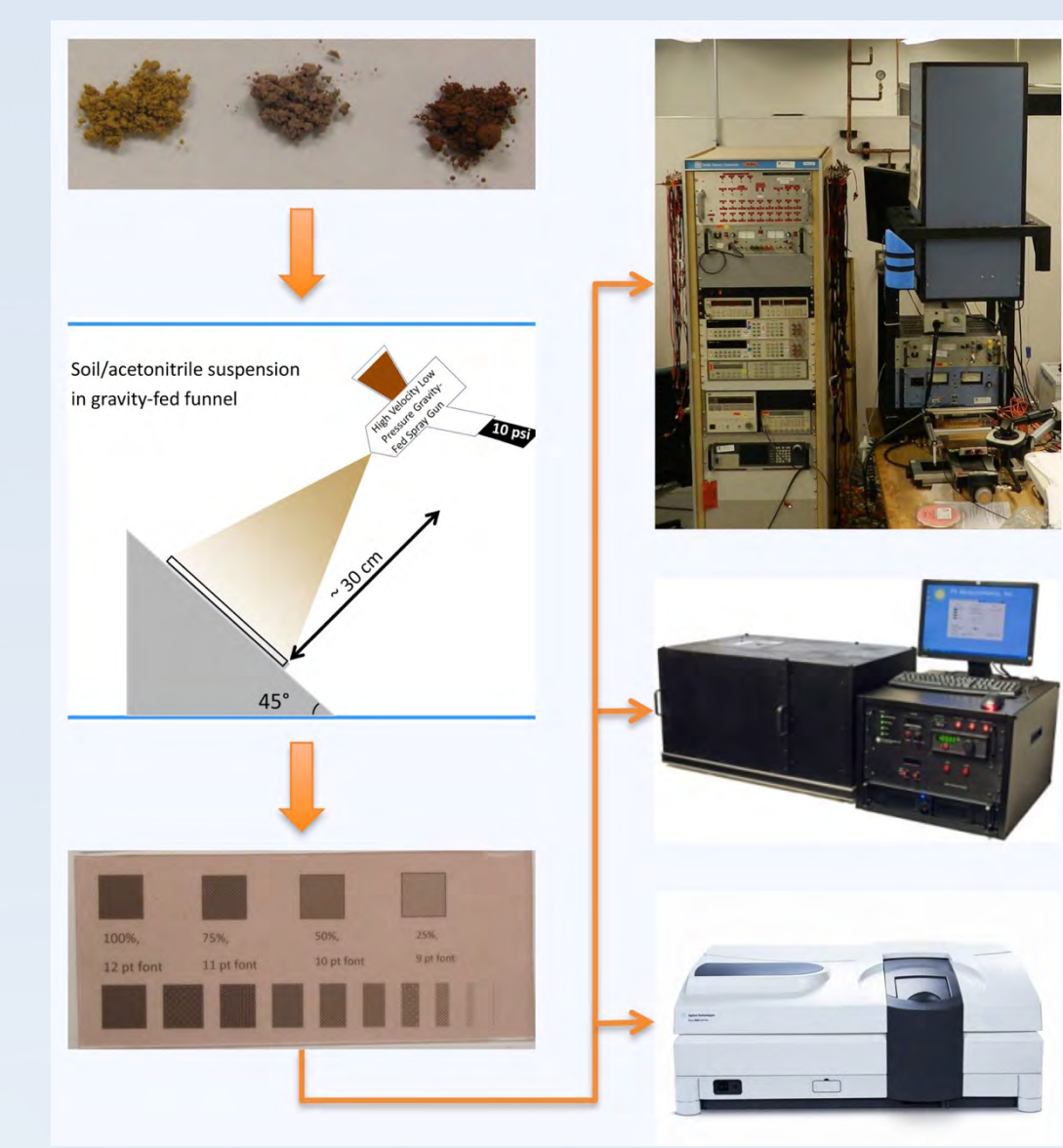
#### PV Lifetime

- Newly established project to assess the lifetime and durability of commercially available PV modules.
- Multi-year, multi-climate effort conducted at the RTC's
- Grid-tied PV systems that reflect U. S. commercial market share. Target 10kW minimum system size (30+ modules).
- 100% pre-deployment flash testing
- In-situ IV sweeps using novel hardware
- Data obtained from these systems will be used to construct degradation rate curves with greater fidelity than currently exists.

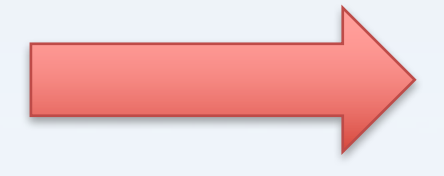
#### Soiling

- Performance loss stations in operation at most RTC sites
- Laboratory tools to study fundamental impacts to PV performances
  - Artificial soiling capability
  - Analytical methods to quantify loss, characterize interaction of incident light with surface soil

#### Predicts II?



### Scalable Deployments from Components to Systems



- 1-month to multi-year installations
- Evaluate materials and component reliability and degradation rates
- Flexible, stand-alone platforms at any orientation
- Tracker-mounted for maximum sun exposure
- Can be set up to be completely autonomous
- Configured per experimental needs

- Minimum 1-year installations typical
- Evaluate system reliability and degradation rates
- Validate energy yield calculations
- DC Voltage and Current (string and combiner)
- Module Temperature
- Localized Irradiance Sensors

Powered by SunShot U.S. Department of Energy

[www.pvrtc.org](http://www.pvrtc.org)

The five DOE Regional Test Centers conduct extensive field-testing to:

- Assess and validate the performance and reliability of new PV technologies and increase the confidence of manufacturers, integrators and the financial community in the bankability of those technologies.
- Better understand validation standards
- Support the DOE SunShot Initiative goals by helping accelerate innovation in the solar sector.

Develop predictive performance models, collect detailed operations and maintenance data, and quantify performance in four areas:

- Design Evaluation and Baseline Testing
- Performance and System Monitoring
- Analysis and Modeling
- Reliability and Safety Key

**Las Vegas, Nevada**  
 Located at a site managed by Southern Nevada Water Authority this site represents a hot, arid climate.

UNLV

**Denver, Colorado**  
 Managed by the National Renewable Energy Laboratory (NREL), this RTC is located at the SolarTAC facility, which has a steppe (arid, high altitude) climate.

NREL

**Williston, Vermont**  
 This site is located at an IBM facility outside Burlington and will provide important data on PV performance under harsh, winter conditions.

IBM The University of Vermont

**Albuquerque, New Mexico**  
 Located at the National Solar Thermal Test Facility on Kirtland Airforce Base in Albuquerque and managed by Sandia National Laboratories, this site represents a hot, arid climate.

Sandia National Laboratories

**Orlando, Florida**  
 Managed by the Florida Solar Energy Center and located at the University of Central Florida, this RTC will test PV performance in a hot tropical environment.

FSEC