

**Researchers and integrators are working to reduce solar photovoltaic (PV) Levelized Cost of Energy (LCOE) to achieve PV power generation cost parity with other electrical generation sources.**



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# Photovoltaics Reliability and Accelerated Life Testing

**Photovoltaics Reliability and Accelerated Life Testing (ALT) provides industry, manufacturing, and academic partners with the data, standards and diagnostic guidelines needed to improve photovoltaic power generation lifetime and predictions and develop more reliable PV technology.**

## Photovoltaics Reliability

Sandia combines decades of science and technology capabilities in Photovoltaic (PV) system optimization, materials assessment and degradation, complex systems reliability and modeling, power electronics, and diagnostics to develop, analyze, and assess lifetime and availability issues related to PV system components.

The lab's reliability research can drive improvements in Levelized Cost of Energy (LCOE) by identifying strengths and weaknesses of different PV plant configurations and operations and maintenance (O&M) procedures, and by providing valuable scenario-based predictive tools that help developers and operators measure performance risks.

## Accelerated Life Testing

Sandia conducts accelerated life testing (ALT) to gather PV component and system performance data, develop standard test protocols for reliability, and define techniques to predict in-field failure mechanisms and mitigate real world failures.

Sandia relies on its decades long history of weapons reliability expertise to devise ALT and diagnostic test methods designed to identify field failures and likely weak spots in PV module, inverter, and other balance of system component designs. Sandia develops and applies accelerated tests for given components using stressors such as thermal cycling, environmental extremes, and voltage extremes, and then assesses the impact of those stressors using diagnostics including electroluminescence, infrared imaging, component electrical performance, and ultrasound imaging.



By testing samples to failure, Sandia researchers can better predict potential failure modes including:

- PV cell material degradation
- Mechanical loss
- Encapsulant degradation
- Loss of electrical conductivity
- Delamination
- Bypass diode failure; and
- Inverter failure

## Commercialization Path

Sandia looks forward to contracting with companies and research institutions to assist them with testing their ideas for new novel technologies. In addition, Sandia seeks partnerships to jointly explore new technologies by making proposals to DOE or other funding agencies.

