

To maintain U.S. competitiveness, the DOE recognizes that more must be done to help companies developing new technologies cross the second “Valley of Death”—the lack of capital resources required to demonstrate the *large-scale manufacturing and economic viability and reliability* (or “bankability”) of a particular technology pathway.

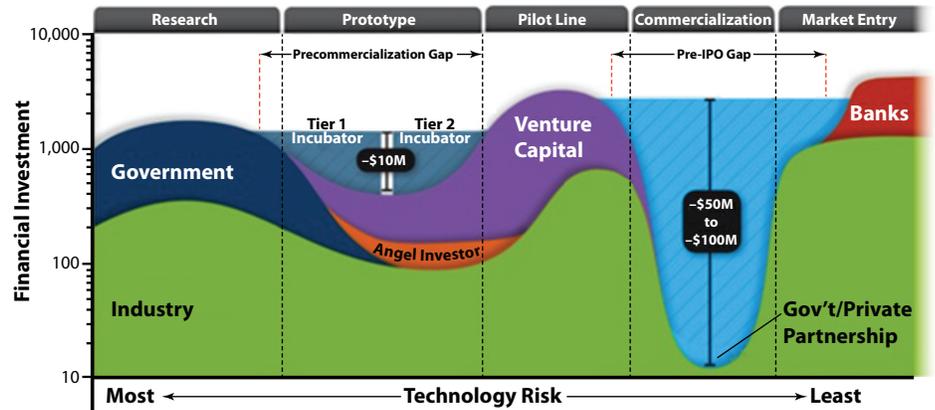
## Vision

To enhance the nation’s security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems.

The RTCs will develop and test processes and procedures for implementing a validation program. To the right is a summary of a data set presented as a ratio of power to direct normal irradiation (DNI).

# Establishing a Regional Test Center to Validate Emerging Photovoltaic Performance and Reliability

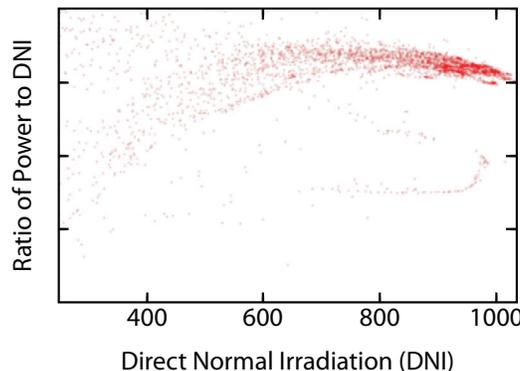
To assure potential customers of a new photovoltaic (PV) technology’s “bankability,” the Department of Energy funded Regional Test Centers to perform real-world testing and monitoring to validate PV manufacturers’ latest technologies.



Photovoltaic manufacturers face challenges in bringing their new technologies to market associated with demonstrating long-term performance and satisfying concerns of the engineers representing financial and insurance communities to assure overall “bankability” of their products. To support U.S. manufacturers, the DOE is developing Regional Test Centers (RTCs) to develop standardized validation guidelines and procedures that, when implemented, will help assure banks, insurance companies, and other stakeholders that new technologies will work with high fidelity and robustness *over time*

and meet contractual obligations. Through testing highly instrumented systems, RTCs will demonstrate the methods to show whether they are operating as expected and that the understanding of these systems is sufficient to project the performance and reliability of other system configurations and environments that use these components.

The Photovoltaics and Distributed Systems Integration Department secured 48 acres at the National Solar Thermal Test Facility for an RTC site for developing large-scale system validation for hot-dry climates (see illustration, next page) and will also manage a facility in Florida for hot-humid climates. The development phase took 11 months as planned; validation implementation is planned for an additional 4 years. The RTC will support an infrastructure design for 1 MW of PV systems plus baseline test equipment, labor, and data analysis at Sandia and at the Florida site. Sandia’s RTC will “open for business” in June 2012.



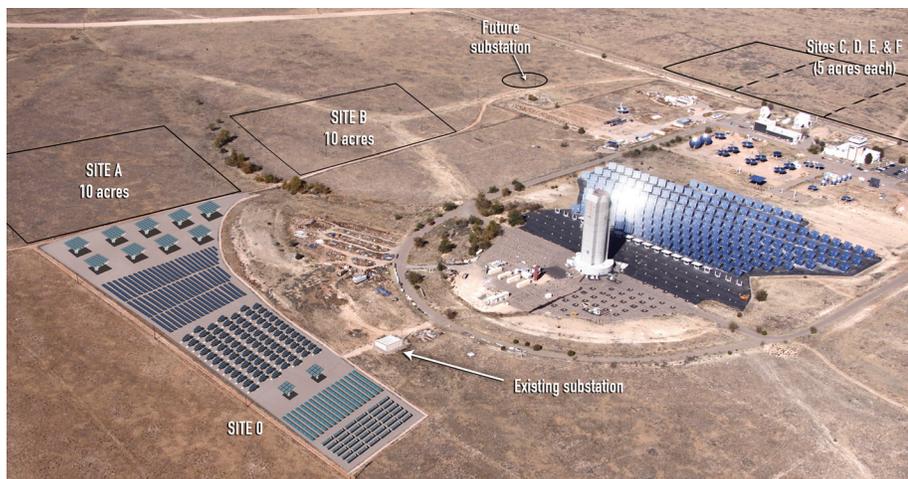
## PV Validation and Bankability Workshop

In August 2011, Sandia, the National Renewable Energy Laboratory (NREL), the Florida Solar Energy Center (FSEC), and the DOE Solar Energy Technologies Program held a workshop with over 60 PV industry leaders to explore the RTC concept and the most useful contributions they can make to the U.S. PV industry—resulting in the following consensus:

- the RTCs should define and publish evaluation standards and protocols rather than endorse PV technologies;
- standards and protocols would aid regional test locations and third-party independent reviewers; and
- the RTCs should develop a standard set of technical requirements and the technical data sets for demonstrating bankability, which could also lead to the development of a standardized bankability report.

## Validation Sampling Protocols and Processes

The RTC team's validation plan is based on the testing and monitoring required to develop a technical data set to support bankability; the data and processes needed to develop standards and guidelines for performance validation, model validation, monitoring practices in the field, and data filtering; and the process for validating the test systems. The validation protocols will accommodate multiple sampling levels to confirm the product's conformance to specifications and can expand



The site plan for the RTC. The 8-acre Site O has four 300 kVA transformers for 1.2 MW DC capacity. The site plan is flexible—allowing us to combine or split lots to accommodate stakeholders' testing criteria. Site O's road, electrical, and communications infrastructure are in place. Expansion into Site A is covered in the preliminary plans. Expansion into Sites B–F will take place as needed.

the sampling regime should a discrepancy be discovered. RTC personnel will measure and analyze consistency across modules, module strings, and entire systems.

The usefulness and applicability of later analysis depends on the quality and "depth" of the data the RTC collects. Our staff is developing the standards and guidelines that define the range of data collected and procedures for collecting and filtering data, operations and maintenance processes, and modeling parameters. These procedures will help establish an industry best practices protocol to be used by other test sites.

## Data Analysis

The validation process developed by the RTCs' primary function is to compare actual performance against the manufacturers' predictions in different climates. We will determine the uncertainties and whether those uncertainties change in different climates. The RTCs will establish data ownership and transparency guidelines to encourage manufacturer participation. Through the RTCs' standardized data-collection processes and data-analysis products, the financial and insurance communities will have additional metrics to form an independent analysis that quantifies the risk and the performance of a PV manufacturer's product.

Data analysis will also be used to develop protocols for PV module, string, and block monitoring to optimally support operations and maintenance at working power-generation installations. The RTCs will also seek to establish the level of monitoring necessary to statistically support the standards and protocols the industry desires

from the RTCs—to determine whether finer-detail monitoring is required to gather the data necessary to accurately quantify the risks important to the stakeholder community.

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