

US DOE REGIONAL TEST CENTERS for SOLAR TECHNOLOGIES: Pathway to Bankability



U.S. DEPARTMENT OF
ENERGY

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ABSTRACT

The US Department of Energy (DOE) operates five Regional Test Centers (RTCs) across the United States (*see figure 1.*) Managed by Sandia National Laboratories and the National Renewable Energy Laboratory, the RTCs are funded by the SunShot Initiative, which seeks to make solar energy cost competitive with other forms of electricity by the end of the decade.

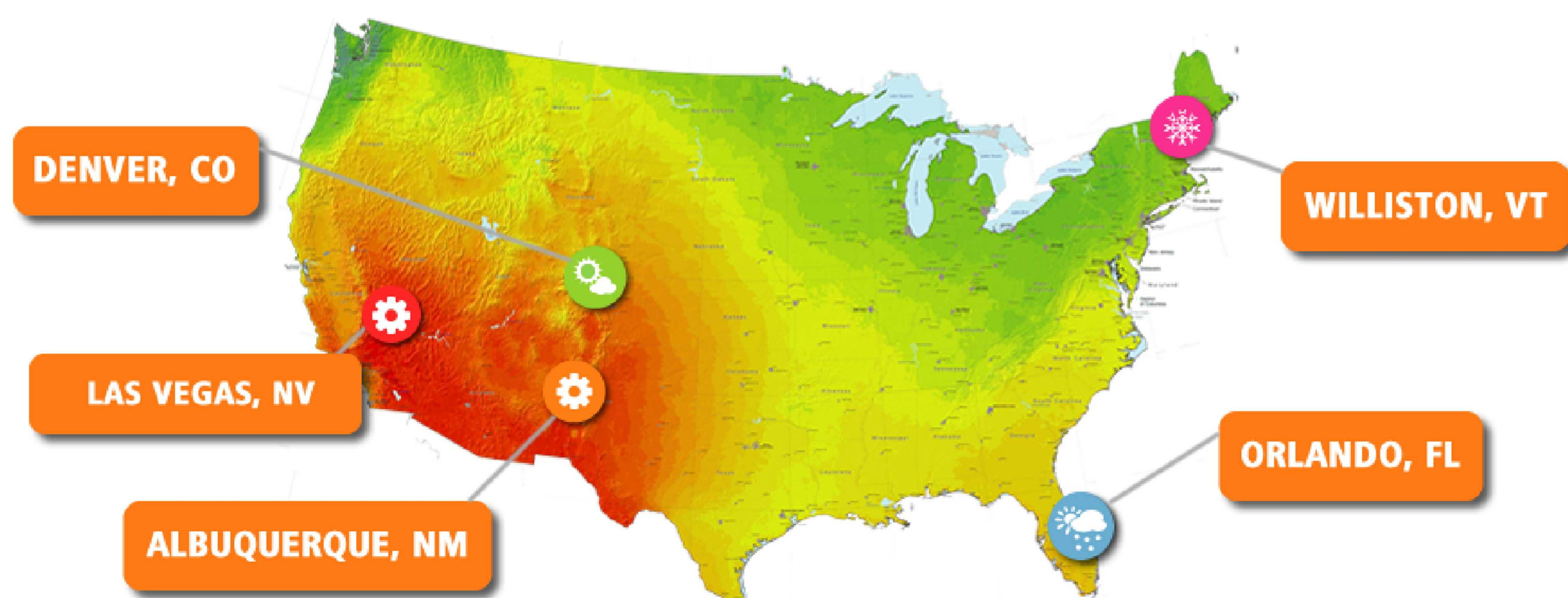
The RTCs 1) validate the performance and reliability of new solar technologies in multiple climates and 2) provide a pathway to bankability for those technologies, thus spurring technical innovation throughout the industry.

PROJECT OBJECTIVES

The RTCs collect performance data from field-installed photovoltaic (PV) and concentrated photovoltaic (CPV) technologies in order to:

- Provide industry partners with data that demonstrates the investment worthiness of new products and accelerates their adoption
- Develop a comprehensive approach to PV validation and establish a technical basis for bankability
- Quantify the impact of climate on the performance and reliability of photovoltaic technologies and systems

A Five Test-Center Network



The RTCs—by demonstrating that products perform as predicted over time and under different climatic conditions-- strengthen the bankability of emerging technologies, and help drive the market penetration of smarter, more efficient systems.

TECHNICAL APPROACH

Validation Plan

The RTC team collaborates with industry partners to create a validation plan that details the following steps:

- Design of the system
- Baseline characterization
- Performance modeling
- Monitoring and data collection
- Performance analytics and validation

System Monitoring and Data Collection

RTC monitoring systems collect high-fidelity data (*see Figure 2*), including:

- String-level current and system AC and DC voltage
- Plane-of-array irradiance (*see Figure 5*.)
- Cell temperature

Meteorological Monitoring

Onsite weather stations at each RTC (*see Figure 4*) collect data on:

- Global horizontal irradiance
- Direct normal irradiance (*see Figure 3*.)
- Diffuse horizontal irradiance
- Precipitation and wind
- Temperature
- Relative humidity

Baseline Data

The RTC program performs baseline characterization of modules that includes optical imaging and flash-testing prior to field testing. Each RTC has a 6kW c-Si array that provides baseline performance data against which the performance of other systems can be compared.

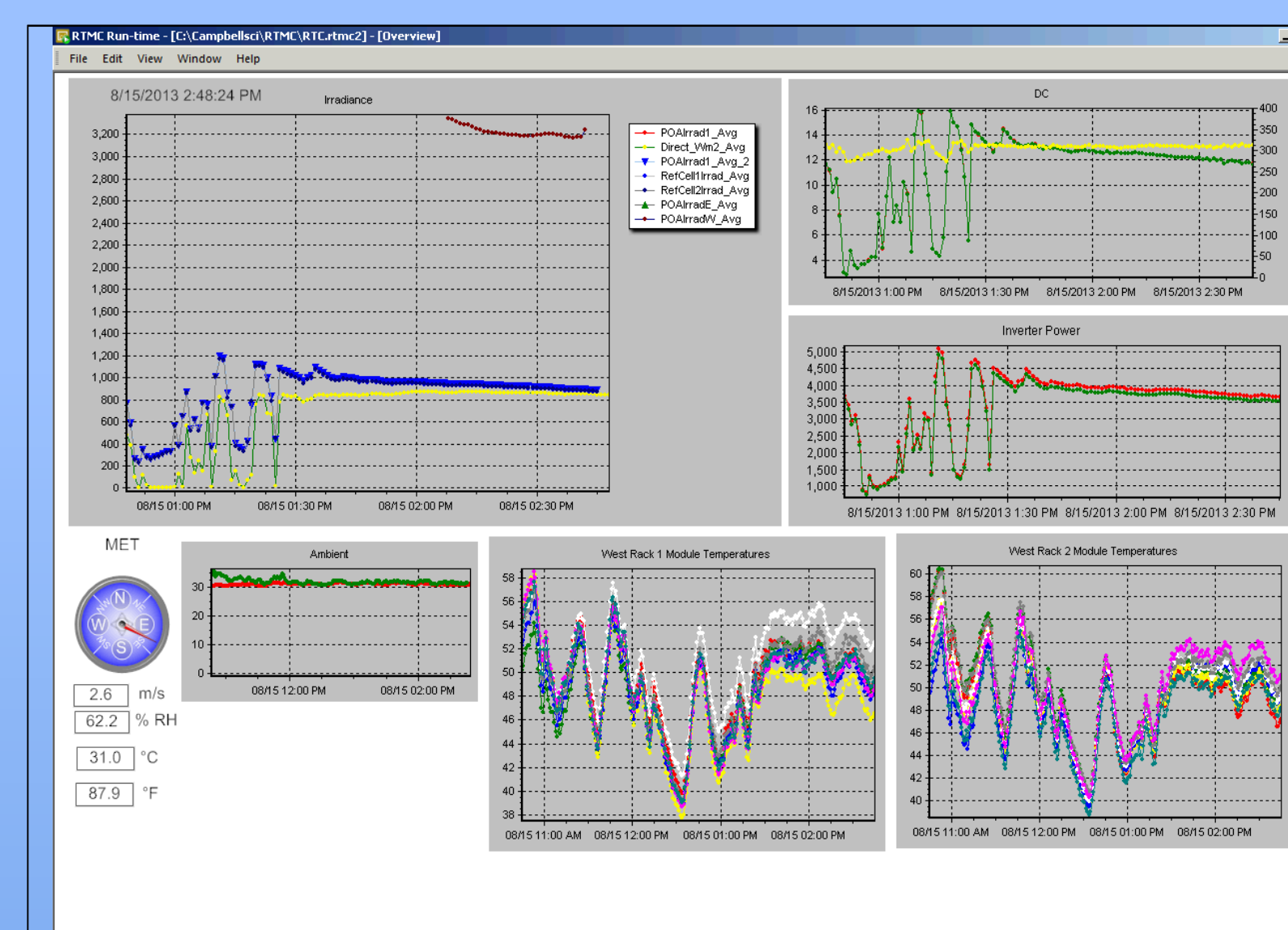


Figure 2. RTC data collected that depicts DC and AC output from a PV system, along with irradiance and meteorological (i.e., ambient temperature) data

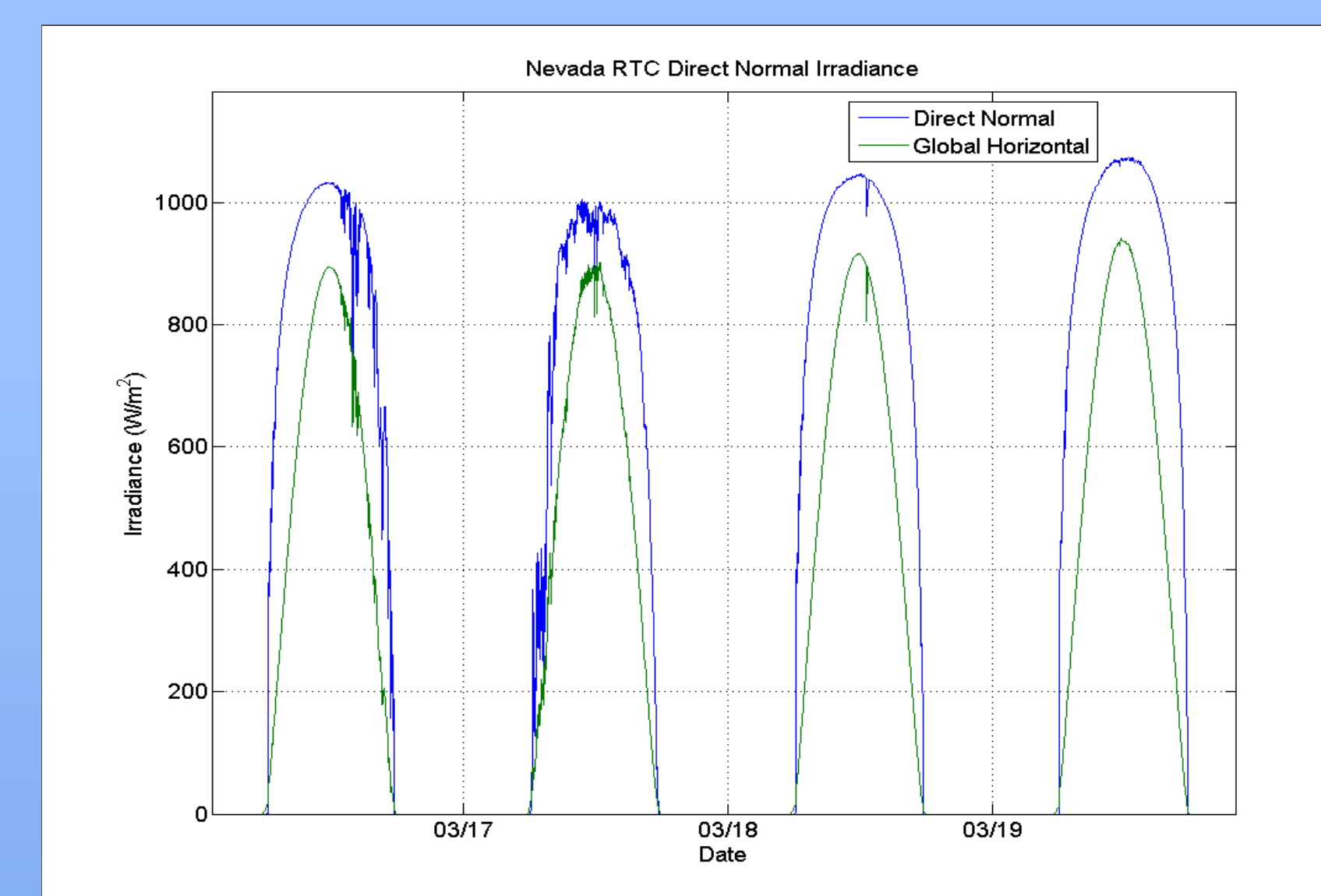


Figure 3. Weather station at each RTC provides high-fidelity data, including irradiance data, which is essential to understanding the energy output of a PV or VPV system.



Figure 4. Meteorological instrumentation at the RTCs.



Figure 5. Pyranometer and two reference cells on the 6kW baseline system at the VT RTC.



Figure 6. Solar tracker measures direct normal irradiance at the Nevada RTC, with 84kW CPV system in the background.

SUPPORTING THE SOLAR INDUSTRY

The RTC program:

- Collects data and provides analysis to demonstrate that a given technology performs as predicted over time and in multiple climates.
- Leverages national-laboratory expertise in PV testing and analysis, systems modeling and reliability to support validation studies.
- Works with industry partners to identify opportunities to improve specific technologies/approaches.
- Builds a foundation of field-based knowledge (including cross-climate performance data) to support bankability standards.
- Develops new test methodologies for emerging technologies.

OPPORTUNITY TO PARTNER

The RTCs invite manufacturers of PV and CPV modules, power electronics and other system components, to partner on a validation study. Companies are chosen via a competitive process with proposals evaluated according to:

1. Demonstrated need: i.e., anticipated technical or economic benefits.
2. Market potential: innovative but technically feasible technology.
3. Cost sharing: willingness to provide financial and in-kind support.
4. Marketability: evidence that the product will be brought to market.

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