Regional Test Centers
Differentiating PV Quality
rtc.sandia.gov

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U.S. Department of Energy

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The Regional Test Centers for Emerging Solar Technologies: System Monitoring

Methodology for Validating Solar PV Technology

The US Department of Energy has established five Regional Test Centers (RTCs) in NM, CO, FL, NV, and VT to demonstrate the bankability of new technologies. Funded by DOE's SunShot Initiative, the RTCs are part of a broad national effort to make solar energy cost-competitive with other forms of electricity by 2020.

Technical Approach to Multiple-Climate System Monitoring

To ensure consistency, the five RTC sites have identical state-of the-art monitoring and data-acquisition systems as well as an identically configured meteorological station (see below.) This approach ensures that data collected at each site can be used to understand and quantify climate and site-specific performance and reliability differences.

RTC staff utilize the data gathered from the RTCs to validate performance and reliability of PV/CPV components and systems, while conducting research on new technologies and grid-interconnected configurations.

RTC Monitoring System

The standard RTC monitoring system:

DC Electrical Monitoring

- 0.1% accuracy current shunts to measure the DC current at the string and system level. All or a high percentage of the string currents are monitored.
- Precision film resistive voltage divider to measure DC voltage up to 1kV for each MPPT input of an inverter.

AC Electrical Monitoring

AC electrical measurements at the inverter level made with a revenue-grade meter and current transducers. The meter measures the following:

- Active, Reactive, and Apparent AC Power
- Power Factor
- Frequency
- Line-to-line and line-to neutral voltage for all three phases
- Line currents for all three phases and neutral

PV Array Temperature Measurements

Thermocouples measure back-of-module temperatures. These measurements are distributed across the array to quantify spatial variations.

Plane-of-array irradiance sensors

Pyranometer and reference cells

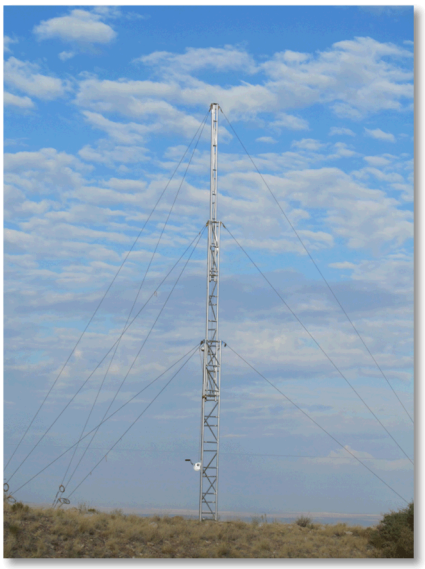
Example of RTC Monitoring Equipment*	
Current transducers	0.1% DC shunts and CR Magnetics Model 189
Power meter	Electro Industries, model: Shark100T--60-10-V4-D2-485P-DIN
Thermocouples	OMEGA SA1
Pyranometer	Kipp & Zonen, CMP11
Reference irradiance sensors	EETS Model RC

*RTC selects monitoring equipment for each project to deliver designed accuracy.

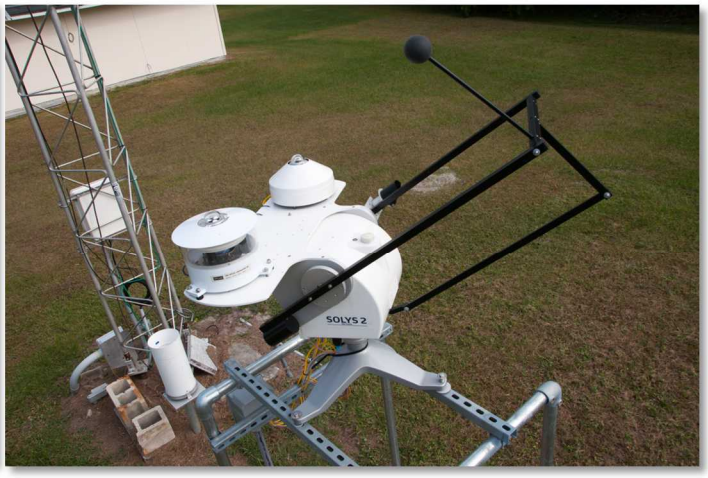
RTC Meteorological Station

Each of the five RTCs is equipped with an identical state-of-the-art meteorological station (see below for instrumentation details) and a data acquisition system that collects data at one-second intervals and combines them into one-minute averages.

In addition, NM and CO RTCs are equipped with Eko Spectroradiometer. The NV RTC has a Black Photon Isotype spectral sensor installed.



RTC Met Station Instrumentation		
Description	Manufacturer	Model
10-meter tower	Aluma Tower Co, Inc.	
Irradiance Sensors		
Direct Normal	Kipp & Zonen	CMP 22
Global horizontal	Kipp & Zonen	CHP 1
Diffuse horizontal	Eppley	8-48
PS Solar Tracker	Kipp & Zonen	SOLYS 2
Barometric Pressure Sensor	Vaisala	PTB110 or CS106
Anemometer	RM Young	03002-L
Humidity and temperature	Vaisala	HMP60-L



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