

Sandia National Laboratories

Photovoltaic Collaborative to Advance Multi-climate Performance and Energy Research (PV CAMPER)

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[see rtc.sandia.gov]

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Introduction

Formed in 2018, PV CAMPER is an international community of research institutions committed to sharing high-fidelity meteorological and performance data in order to advance photovoltaic (PV) research and expand solar markets. To date, PV CAMPER has 11 member institutions, representing a network of 13 field sites that span both hemispheres and most major climate zones.

Each institution is committed to maintaining comparable standards for data quality and availability, to sharing data and to actively engaging in collaborative research.

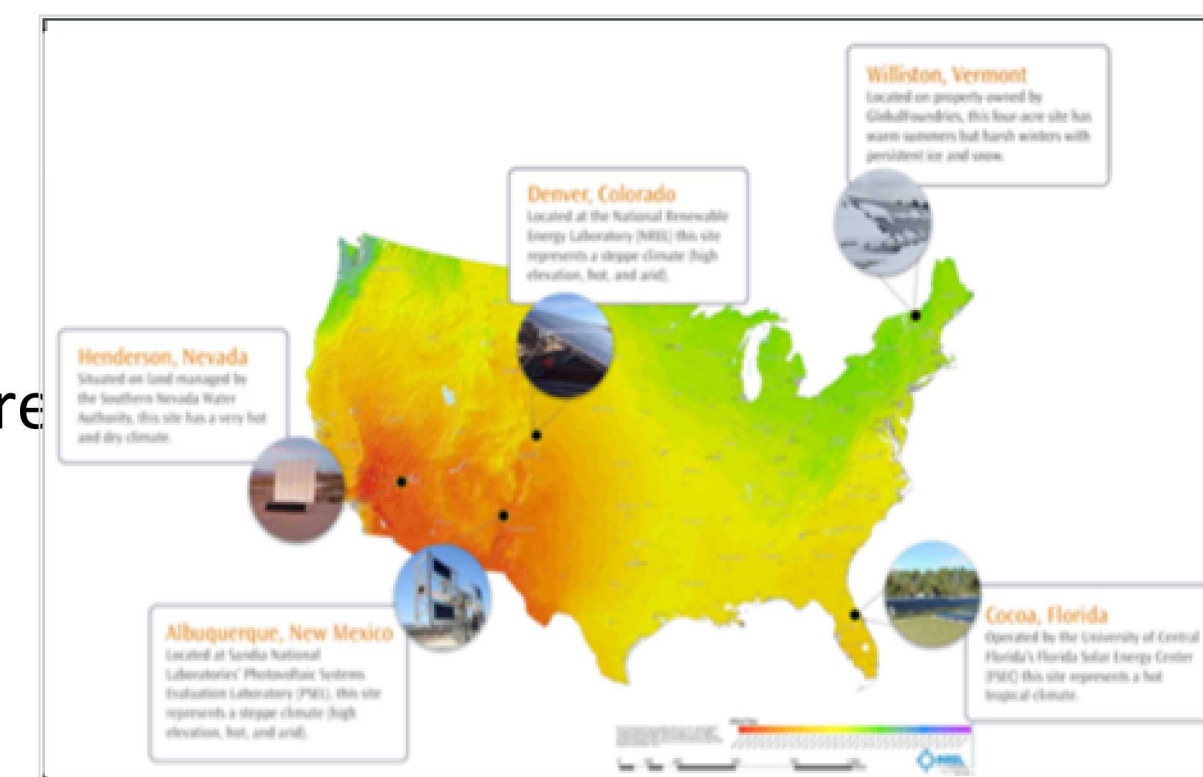
Technical Objectives

Foster collaborative R&D in the areas of PV performance- validation and reliability

- Provide a global platform for evaluating emerging PV technologies and for identifying and quantifying the factors that contribute most to climate- specific efficiencies
- Generate a set of best practices with respect to data collection; quantify and reduce measurement uncertainties and increase the accuracy and global applicability of performance models
- Develop a technical basis for matching new technologies, including novel cell and module types, to their operating environments (spectral sensitivities, irradiance characteristics, temperature range, etc.)

History

This project is based on the Regional Test Center (RTC) program in the U.S. Managed by Sandia, with support from NREL, the program supports five climatically distinct field sites, each with a similar infrastructure and instrumentation. Collectively, they enable the collection of high-fidelity PV performance data from emerging solar technologies



Research Activities

PV CAMPER has several research projects underway of importance to the solar community:

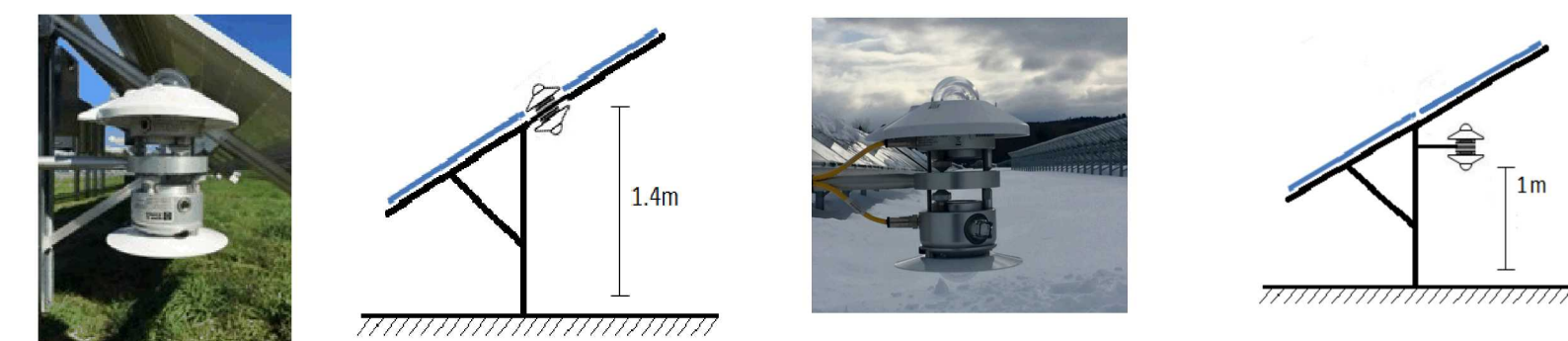
Pyranometer Uncertainty

Pyranometers calibrated to the same standard by the same lab will be distributed to PV CAMPER members for field deployment and recalibrated at the end of a year.



Global Albedo Analysis

Ground-based horizontal and plane-of-array albedo measurements will be analysed for diurnal and seasonal changes and compared with satellite measurements



Global Soiling Analysis

Multiple types of soiling instruments will be deployed and data collected on soiling losses as well as the composition of particulates throughout the year



Back-of-Module Temperature Study

Intent is to quantify the accuracy and reliability of different temperature sensors and build a global database.

Membership Requirements

PV CAMPER welcomes new members willing to meet the organization's high standards for outdoor field sites. Each member must have a facility that has:

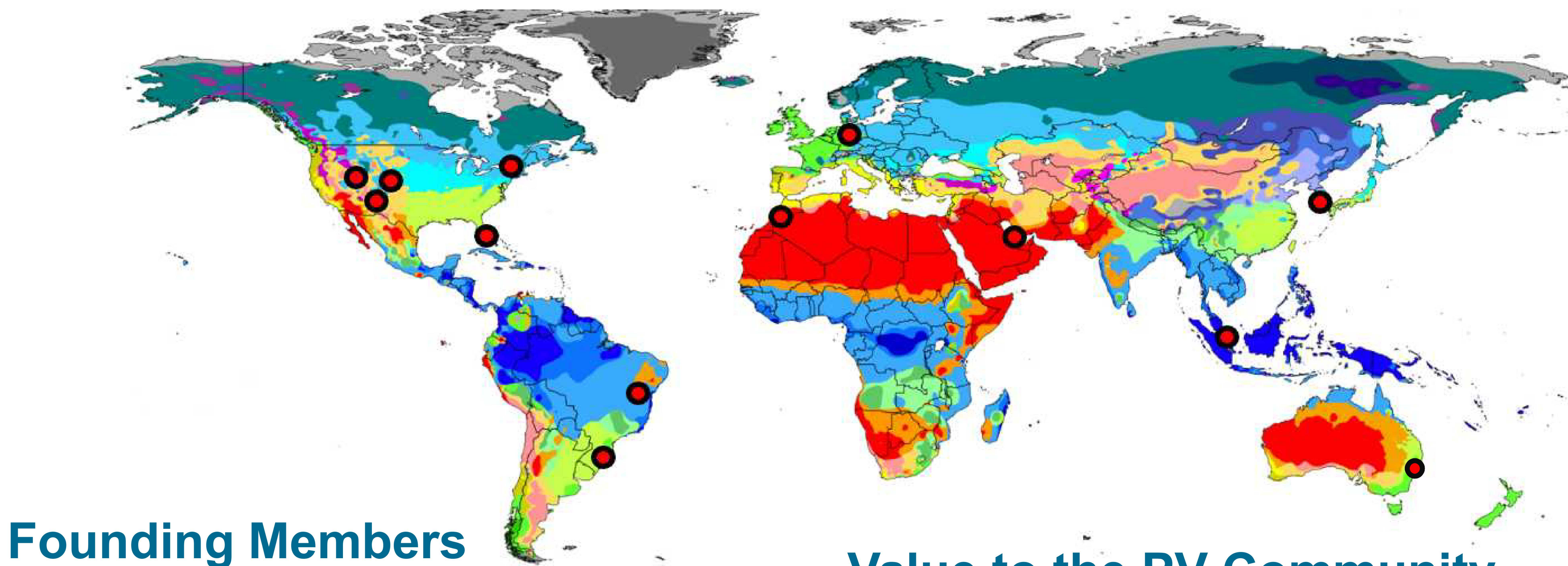
- A grid-tied crystalline-silicon PV reference system
 - High-accuracy meteorological and irradiance instrumentation (DNI, GHI, DHI, POA and albedo)
 - High-resolution DC data-monitoring instrumentation to measure PV system performance;
 - High-frequency data acquisition systems
 - Module characterization capabilities that meet IEC standards
- In addition, each member must agree to:
- Adhere to common standards for data quality and availability
 - Data-sharing with other members
 - Partner on research projects of interest to the collaborative

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Founding Members

Australia: Commonwealth Scientific and Industrial Research Organization (CSIRO)



Brazil: Universidade Federal de Santa Catarina



Germany: Anhalt University of Applied Sciences



Germany: Fraunhofer Center for Silicon Photovoltaics



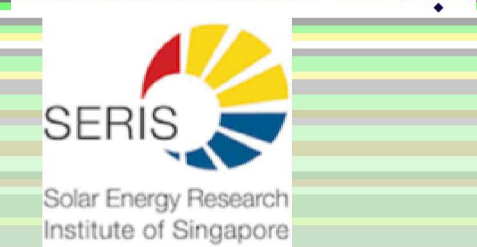
Morocco: Institut de Recherche en Energie Solaire et en Energies Nouvelles (IRESEN)



Qatar: Qatar Environment & Energy Research Institute (QEERI)



Singapore: Solar Energy Research Institute of Singapore (SERIS)



South Korea: Yeungnam University



South Korea: Korean Institute for Energy Research



South Korea: Korea Testing Laboratory



USA: Sandia National Laboratories



Value to the PV Community

- PV CAMPER has created a technical platform for sharing meteorological and PV performance data from the world's major climatic zones
- This network of field laboratories makes possible multi-- institutional, cross-climate research, including degradation, reliability and optimization studies
- PV CAMPER's multiple field sites are also available to industry for the testing and evaluation of new technologies
- The operating model is extensible and flexible, able to support new members and emerging research challenges

