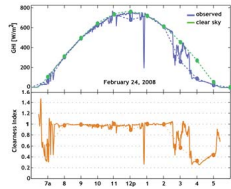


Foundational Solar Resource Research

National Renewable Energy Laboratory

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SYSTEMS INTEGRATION



The Solar Resource Characterization Group conducts foundational solar radiation and power research that supports industry, government, and academia by providing solar measurements, models, maps, and support services. These resources are used to plan, develop, and integrate renewable energy technologies.

Support Services

Solar measurements and products

National Solar Radiation Database (NSRDB)

- Long-term, serially complete, hourly solar irradiance for 1991–2005
- Three formats available:
 - Hourly, 10km gridded irradiance
 - Hourly, 10km gridded irradiance and meteorological fields
 - Hourly irradiance at 1,454 locations
- Recently updated to include 2005–2010 and additional locations

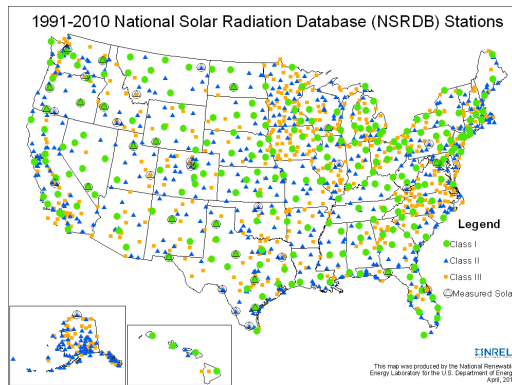


Figure 1. New map of NSRDB locations for 1991–2010 update.

Typical Meteorological Year (TMY)

- Hourly meteorological data that represent the “typical” climate for a specific location.
- Applications: solar power system development, P50/P90 analysis, financing solar power systems, building efficiency performance, and others

Solar Characterization

Solar irradiance and power modeling and analysis

Solar Variability

- Impacts of solar spectrum variability on measurement uncertainty
- Optimization of distributed solar system allocation within a geographic region to maximize generation and minimize variability
- Intra-plant and plant-to-plant variability

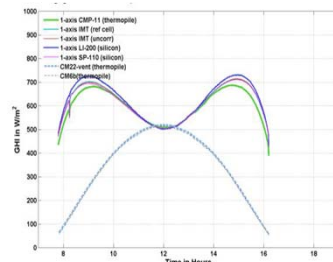


Figure 2. Impact of solar spectrum variability on different instruments

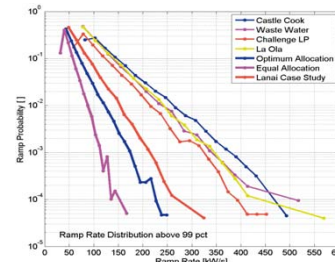


Figure 3. Probability distribution of ramp rates over the 99th percentile.

Satellite-Derived Irradiance

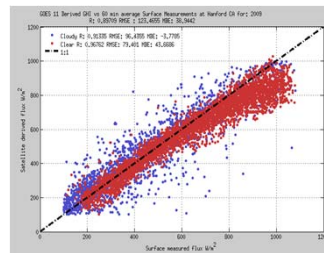


Figure 4. Scatter plot for cloudy and clear conditions in Hanford, CA

- Global Solar Insolation Project (GSIP)
- Performance of physics-based versus empirically-based irradiance estimates from satellite

Solar Forecasting

Forecast development, testing, and benchmarking

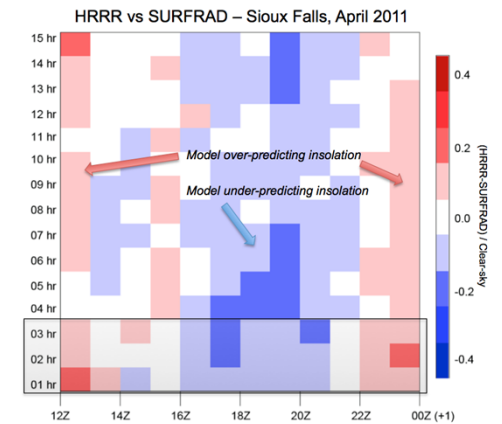


Figure 5. Normalized HRRR-SURFRAD histogram of forecast error.

- Verification of NOAA's High Resolution Rapid Refresh (HRRR) irradiance forecasting performance
- Nowcasting with total sky imagery



Figure 6. Total Sky Imager.