NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Improved Rotating Shadowband Radiometer Measurement Performance

Cooperative Research and Development Final Report

CRADA Number: CRD-08-294

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Cooperative Research and Development Final Report

In accordance with Requirements set forth in Article XI.A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

Parties to the Agreement: Irradiance, Inc.

CRADA Number: CRD-08-294

CRADA Title: Improved Rotating Shadowband Radiometer Measurement Performance

Joint Work Statement Funding Table Showing DOE Commitment:

Estimated Costs	NREL Shared Resources
Year 1	$ 100,000.00
Year 2	$ 33,018.00
TOTALS	$ 133,018.00

Abstract of CRADA Work:

Under this Agreement, NREL will work with Participant to improve rotating shadowband radiometer (RSR) performance characterizations. This work includes, but is not limited to, research and development (R&D) for making the RSR a more accurate and fully characterized instrument for solar power technology development and commercial solar power project site assessment. Cooperative R&D is proposed in three areas: instrument calibration, instrument field configuration and operation, and measurement extrapolation and interpolation using satellite images. This work will be conducted at NREL and Participant facilities.

Summary of Research Results:

Accurate solar radiation datasets are the foundation of a successful solar energy project and are critical in reducing the expense associated with mitigating performance risk of these projects. Further, as solar energy systems become more prevalent, accurate solar radiation datasets are becoming critical because utility planners and grid system operators will need to understand how high penetrations of solar energy systems depend on a variable solar resource. NREL and Irradiance, Inc., through a cooperative R&D, improved the quality of data obtained from RSRs by implementing up-to-date calibration and characterization techniques. Irradiance, Inc. improved the RSR performance, calibration, field configuration, and operation, using the reference solar irradiance data from the Baseline Measurement System (BMS) at NREL's Solar Radiation Research Laboratory (SRRL). These RSR improvements were tested and implemented at SRRL and over a dozen field installations. Some of the enhancements include improved sensor connections to allow sensors to be changed easily for calibration, creating a standardized

data logging program, and improving algorithms to compute solar irradiance. NREL also published a technical report (http://www.nrel.gov/docs/fy14osti/60896.pdf) on radiometric data evaluation from multiple instruments and the RSR with improved algorithm as part of the evaluation, and the result shows low MBE and RMSE compared to similar sensor with no improved algorithm. Further, the participant calibrated and characterized over 1,000 solar sensors by utilizing NREL–SRRL world class radiometric instrumentation infrastructure. The sensors were deployed alongside the SRRL instrumentation so that they could be calibrated and characterized using algorithms developed by the participant. These sensors were later used in field installations all over the world.

Solar irradiance data for BMS as well as the NREL-owned RSR can be found on the Measurement and Instrumentation Data Center (MIDC) web site (http://www.nrel.gov/midc/srrl_bms/).

Subject Inventions Listing:

None

Report Date:

January 13, 2015

Responsible Technical Contact at Alliance/NREL:

Afshin M. Andreas

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