NATIONAL RENEWABLE ENERGY LABORATORY

Welcome!

NREL Pyrheliometer Comparisons 2016

NPC-2016

26 September – 7 October

NPC-2014 Participants

15013 Denver West Parkway
Golden, CO 80401
Phone 303-275-3000

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

Radiometers at the Solar Radiation Research Laboratory (SRRL)

Welcome to the 19th NREL Pyrheliometer Comparisons NPC-2016

26 September – 7 October 2016
Solar Radiation Research Laboratory
Golden, Colorado

The purpose of this NPC is to provide participants with current World Radiometric Reference (WRR) reduction factors for their absolute cavity radiometers and other reference pyrheliometers based on results from the 12th International Pyrheliometer Comparisons (IPC-XII) conducted 28 September – 16 October 2015 at the Physikalisch-Meteorologisches Observatorium Davos/World Radiation Center (PMOD/WRC). Information about IPC-XII is available from : **http://www.pmodwrc.ch/pmod.php?topic=ipcxii**

C O N T E N T S

SRRL Staff

NREL Metrology Laboratory & Solar Resources & Forecasting Group

Afshin Andreas	Computer Issues, NREL Cavity Operations
Mike Dooraghi	Solar Trackers, Tools, Electronics and Hardware, NREL Cavity Operations
Aron Habte	General Assistance, Data collection and compilation
Mark Kutchenreiter	Electrical Power, Tools, Electronics and Hardware
Martina Newman	Host (Security, Logistics, Food, Wireless Access)
Ibrahim Reda	NREL Cavity Operations, NPC Data Collection & Processing, General Cavity Assistance

SRRL Location

Solar Radiation Research Laboratory
(SRRL)

Latitude:	39.742 N
Longitude:	105.18 W
Elevation:	1828.8 m AMSL
Mean Station Pressure:	820 mBar
Time Zone:	(GMT – 7.0)
Phone:	303-384-6326
Emergency Phone:	1234 (on-site)

Telephone Numbers:

EMERGENCY = 303-384-6811
Or
1 2 3 4 (From ***any*** NREL Desk Phone)

SRRL = 303-384-6326

Safety

Emergency Phone: **RED BOX** UNDER INSTRUMENT DECK
OR Press **1 2 3 4** from any NREL extension

Evacuation Assembly Area: Northeast Corner of Parking Area

Security

Phone: 303-384-6811 or Press 6811 from any NREL extension

NREL *Visitor Badges* issued on first day of NPC at the Visitor Center. If you are NOT a U.S. Citizen, then please present the same documentation (Passport, Visa, etc.) you used on the NREL

Foreign National Data Card (FNDC). Please wear your badge at all times at SRRL.

Communications

Local (Long Distance): **9** – (1) Area Code – Number

Wireless available at SRRL – ***Please see Martina for details***

Food & Beverages

Lunch Menu will be circulated daily by 9:30 MDT

Non-alcoholic Beverages and snacks provided

Equipment Storage

Please use ***designated areas*** in SRRL staging areas.

NPC-2016 Protocol Summary

Ibrahim Reda

1. Schedule

DAY # 1 September 26th

a. Visitor check-in at NREL Site Entrance Building, 15013 Denver West Parkway, Golden, CO 80401.
Please plan to arrive at NREL between 07:30 and 08:00 MDT.
b. Drive to SRRL – Call 303-384-6326 to open gate
c. 08:30 MDT - Equipment Installation & tests:
Dry Weather - See the **outdoor *seating diagram*** below for your workstation.
Wet Weather – Assemble and bench test your equipment inside SRRL.
Locate your equipment and review seating charts
d. 10:00 MDT - Safety and SRRL orientation briefing for all participants.
e. Review of NPC Protocol
f. Review measurement protocol and procedures.
g. 11:00 to Sunset - Practice and/or NPC measurements (weather permitting)

DAYS #2-12: 27 September through 07 October (*Daily*, including the weekend):

a. Clear sky = Take Measurements!
-Arrive at SRRL by 08:00 MDT
-Equipment warm-up for at least 30-minutes
-First Cavity Calibration at 08:55 MDT
-Begin comparison "Runs" by 09:00 MDT (08:00 MST)
-Continue measurements until sundown or the clouds interfere.
b. Cloudy sky = No Measurements, but optionally...
-Review of previous day's data analyses
-Technical Briefings on Radiometry, Measurement Network Operations, etc.
-Equipment Test
-Office Time (wireless available)
c. We will determine the need for continued measurements at the end of each day.

2. Time Keeping

-Wim Zaaiman will again be our timekeeper (as long as his voice holds out!)
-***All time records will be Mountain Standard Time (MST)***
-Outdoor time display is available for guidance ***(Wim's time is the Reference Time!)***
-The NIST atomic clock is a local call: 9-303-499-7111.
-We need to keep all PC clocks in agreement to better than 1 sec.
-***Set your system clock at the daily start-up*** or as often as needed to keep 1-second accuracy. Check personal computer clocks during the day.

3. Minimum Data Set

Our goal for a minimum data set for these comparisons is to measure irradiance during three different days (all day or portion). Historically, we have acquired more 3,000 data values for each participating cavity radiometer. At least 300 data values are needed to provide a valid transfer of the WRR to the participating radiometers.

4. Measurements

- Do NOT apply any previous **WRR** correction factors to your measurements.
- Use only the **factory calibration factor** to adjust your data beyond any other adjustments you feel are needed to correct your data (e.g., pre- and post-calibration drifts in sensitivity are OK). As in the past, we will use the following terms:

"Calibrate" = Perform electrical calibration and wait for next measurement period to begin
"Read" = A measurement of direct irradiance within 1 sec of announcement at 20-sec intervals.
"Run" = Collection of 37 readings taken in sequence (also called a *Series*).

The *Timekeeper* will make the following announcements for each Run:

Next Run Begins at HH:MM (MST) [HH:MM (MDT)]
T minus 6 minutes. BEGIN CALIBRATION
T minus 3 minutes
T minus 2 minutes
T minus 1 minute
T minus 30 sec
T minus 10 sec
T minus 5 - 4 - 3 - 2 - 1 - READ!

Continued countdowns at 20 sec intervals until 37 readings have completed a "Run"

6. Data Transfer

The following *standard data format* will be used by each participant to improve our data processing efficiency. Please see the emailed example file format or see Reda if you have any questions about the data format.

After the last daily RUN, and ***before*** equipment tear-down, email your data file to Aron and Reda aron.habte@nrel.gov and Ibrahim.reda@nrel.gov. Cavity calibration files are not needed

7. Data Processing

- Described in each NPC published/distributed report.

8. Data Reporting

-Our goal is to provide each participant with next-day analyses.
-A final report will be published by NREL within two months of the comparisons.

9. Equipment Storage

-Each participant will be given space to store systems at SRRL.
-Please let us know if you wish to have any electronics connected to AC power while in storage.

10. Courtesies

-Please get permission before touching someone else's equipment (turning off power strips, adjusting trackers, etc.) to prevent inadvertent data loss.
-Please return borrowed tools to owner.

11. Dinner on Wednesday (September 28th)

Please join us for the NPC Dinner!

Dinner will be at a local restaurant and bar called the Rock Rest Lodge. We will meet for dinner between 6:30 and 7:00 PM.