

CSP & PV Performance Case Studies & Improvements

Technical Session: Thursday 10/12/17 09:00 – 10:15

Tivoli: LoRaine Good 444



Tom Stoffel, Andy Walker, Otto VanGeet, Adam Baker, Joe Ranalli, David Comis, and Kary Ritter

Summary

This session focused on the importance of measurements for assessing PV system performance and reliability, siting PV or CSP systems with proper solar access, developing a novel design for lighter weight PV modules with lower wind resistance, and the impacts of collector soiling on system performance.

Key Findings & Recommendations (By Speaker)

1-Andy Walker, NREL

- 3rd Edition coming for Best Practices in Photovoltaic System Operations and Maintenance www.nrel.gov/docs/fy17osti/67553.pdf (most accessed document on NREL Publications site).
- On-line implementation of PV O&M cost model, Working Group, and information clearing house by SunSpec Alliance is available from sunspec.org.
- Cost Model estimates provided for Balance of System (BOS) and PV Performance, including cost/benefit of module cleaning.
- Sandia hosts the PV Reliability, Operations & Maintenance (PVRM) database of failure and reliability data: <http://energy.sandia.gov/tag/pvrrom/>

2-Adam Baker, Affinity Energy

- Provides methods for translating large amounts of available PV system measurements into meaningful information for use by system operators.
- Operators are failing to identify system performance issues because data without context is meaningless.
- Data analysis tools provide operators with cost/benefit values of O&M practices

3-Joseph Ranalli, Penn State Hazleton

- Accurate shading measurements are needed to reduce uncertainty of system performance modeling
- Evaluated three site survey tools for conducting solar access analyses.
- Smart phone application available for horizon mapping.

4-Otto VanGeet, NREL

- PV Slat Modules are a new approach for installing systems with improved form factors with reduced self-shading and reduced structural balance of system and installation costs due to low wind loading
- Proof of concept of Slat modules based on models made by 3-D printing and tested in wind tunnel.

5-Kary Ritter, University of Louisiana at Lafayette

- Collector soiling can result in up to 60% loss in performance that is completely reversible with washing..
- Soiling amounts and frequency are very site-specific.
- Based on performance and electricity cost data input to the soiling formula developed by Sandia National Laboratories, optimal mirror cleaning interval of the 50 kWe CSP plant at the University of Louisiana/Lafayette Solar Technology Applied Research & Testing (START) Lab is 114 days.
- The START Lab is developing a Soiling Testbed for continued research.

6-David Comis, Maryland Energy Administration (Walk-in addition to schedule)

- Introduction to siting tools used to predict solar access/shading:
 - Lidar Mapping (www.mapdwell.com/en/solar)
 - Google Project SunRoof (www.google.com/get/sunroof/faq/)
 - Aerial Imaging from Google Earth
 - Sun Path Charts from the University of Oregon's Solar Monitoring Laboratory (<http://solardat.uoregon.edu/>)

Q/A Notes (by speaker number)

1. *Will the PV system cost model differentiate between long-term degradation due to module soiling vs. component failure? What is the cost of cleaning?*

(Ans) The cost models include performance and operations and maintenance.

2. (Several comments supporting the importance of understanding what the performance data could be showing system operators.)

3. *Did you consider evaluating other commercially available solar shading tools, i.e., the Solar Path Finder?*

(Ans) The evaluation was based on easy-to-use equipment.

4. *How can you confirm the cost/benefit of the PV Slat Module concept?*

(Ans) The next step is to find support for building a full-scale Slat Module for testing.

5.1 *How do soiling rates (i.e., the derivative of the Sandia equation) affect the optimal number of days between cleaning?*

(Ans) Need to look at the Levelized Cost of Energy.

5.2 *What are the impacts of the cost and availability of de-ionized water used for cleaning the collectors?*

(Ans) We used readily available tap water to produce the de-ionized water.

5.3 *Have you investigated seasonal soiling?*

(Ans) Planning to take weekly measurements and note rain events.