

Sandia National Laboratories and the Electric Power Research Institute (EPRI) are pleased to host the

2013 Inverter Reliability Workshop



Photo courtesy of Sempra Energy

Dates: 8:00 AM to 5:00 PM on Tuesday, April 30, 2013
8:00 AM to 1:00 PM on Wednesday, May 1, 2013

Location: The Biltmore Hotel, 2151 Laurelwood Road, Santa Clara, CA

Inverter reliability drives project life cycle costs and plant performance. This workshop will focus on current reliability issues and develop a roadmap to define the gaps and the path forward for inverter reliability.

Draft Agenda : Day 1: April 30

Registration and Morning Coffee

8:00am

Welcome & Introduction: Why Are We Here?

8:30am

An overview of the workshop will be presented, along with intended outcomes, goals and next steps. In addition, meeting participants will introduce themselves.

- Welcome/Introductions (10 min) – Charlie Hanley, Sandia National Laboratories
- Summary of Survey Results (30 min)- TBD, Sandia National Laboratories

Inverter Reliability: State of the Industry

9:10am

A cross section of industry stakeholders will discuss various aspects of inverter reliability.

- O&M Aspects of Inverter Reliability (20 min) – Dan Sweeney, Advanced Energy, Inc.
- Systems Impacts on Reliability (20 min) – Mike Schenck, First Solar
- Component Level Reliability (20 min) – Janet Ma, Schneider Electric **tentative**
- Thermal management (20 min) – Kenneth Armijo, Sandia National Laboratories

Break

10:30am

Next Generation and Cross-Industry

11:00am

An overview of module-scale conversion reliability aspects, potential impacts of next-generation inverter technologies, and reliability from the viewpoint of a different industry

- Module-Scale Conversion (20 min) – Timothy Peshek, Case Western University
- Next Generation Inverter Technologies (20 min) – Sig Gonzalez, SNL and Aminul Huque, EPRI
- Cross-Industry Reliability: Automotive Power Module Perspective (20 min) – Zhenxian Liang, Oak Ridge NL

Lunch (included)

12:00pm

Breakout Session #1

1:00pm

Intended outcomes of the breakout sessions: Identify primary failure modes, gaps, and potential for condition-based monitoring

A: O&M Aspects of Reliability / System impacts on reliability

Topics: Brainstorm on the impacts of system designs on inverter reliability and vice versa. What information is missing in the industry? What failures are arising that were not designed for or tested for?

Moderator: Jennifer Granata

Short talk: TBD

B: Component Level Reliability



Topics: Reliability of Capacitors, Power switches, Boards, Connectors. Identify the primary gaps/issues in each area, primary failure modes being addressed, and failure modes not yet being addressed (why?)

Moderator: Bob Kaplar

Short talk: Jack Flicker, SNL

C: Next Generation Inverter Technologies

Topics: Have failure modes been identified for next gen technologies? What type of testing is being applied? What type of testing could be applied (is qualification testing being implemented or needed)?

Moderators: Sig Gonzalez, Jay Johnson

Short talk: Mike Ropp, **tentative**

Break **2:30pm**

Breakout Session #2 **3:00pm**

Intended outcomes of the breakout sessions: Identify primary failure modes, gaps, and potential for condition-based monitoring.

D: Module-Scale Conversion

Topics: Inverter/converter lifetime, failure modes, testing of components versus in a system (module), test to failure

Moderators: Bob Kaplar

Short talk: Scott McCalmont, Tigo

E: Thermal Management

Topics: Design effects, fans, liquid cooling, effects of solar gain

Moderators: Rob Sorensen

Short talk: TBD

F: Performance / Reliability/Cost Trade-space

Topics: What constitutes a failure? Acceptable failure rates, Repair / replacement strategy, Allowable reduction in output power prior to repair, Scheduled vs. unscheduled maintenance, Contracted O&M

Moderators: Aminul Huque

Short talk: TBD

Day 1 Wrap-Up/Adjourn **4:30 – 5:00pm**

Draft Agenda: Day 2: May 1

Registration and Morning Coffee **8:00am**

Standards and Reports **8:30pm**

- Update on IEC 6210- Qualification Standards (15 min) – Greg Ball, DNV Engineering
- Report out on the Breakout Sessions (45 min) - Moderators



Break **9:30 am**

Technology Roadmap **10:00 am**

- Based on the results of the breakout sessions, we will brainstorm on the development of a technology roadmap for inverter reliability (1:15 min)
- Recommended Future Actions (30 min)

Wrap-Up & Closing Remarks **11:45 am**

The workshop hosts will recap key meeting takeaways and next steps.

Adjourn/Lunch **Noon**