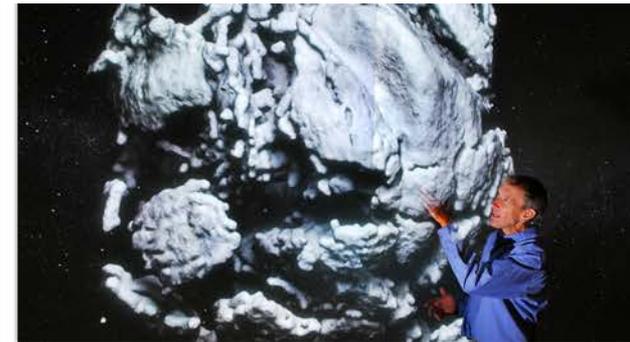


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2013 Inverter Reliability Workshop Breakout Session A: O&M Aspects/Systems Impacts

Moderators: Jennifer Granata, Roger Hill

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A: O&M Aspects/Systems Impacts

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Questions for discussion:

- What are the impacts of system designs on inverter reliability?
- What are the impacts of inverter reliability on system designs?
- What O&M aspects should be included to impact inverter reliability?
- What information is currently missing to improve the overall system reliability?
- What failures are arising that were not designed for or tested for?
- How should we test for dynamic impacts?
- How should we test for interference?

What's Missing in O&M Aspects of Inverter Reliability/System Impacts on Reliability?

Gaps:

- Reliability—actually it is unreliability or un-availability that we talk about and focus on, like outages and failures—Where is the data?
- DC to AC ratio, clipping, duty, margin in design, ability for VAR support, durations and data
- Product qualification. Lack of specifications, standards, test protocols, third party witness tests. Whole range of considerations.
- What constitutes a failure, acceptable failure rates, repair/replacement strategies, allowable reductions in output power prior to repair, scheduled vs. unscheduled maintenance, contracted O&M. Need for basic definitions and upfront work
- What was tested for and what was not? Users need more clarification.
- Costs? And justification of investments to solve issues
- We need to organize to interact with each other.

Observations and Issues

- Quality may be a matter of getting requirements, needs and expectations aligned
- Inverters will always have attention. It is in a process of evolving by the nature of what it does, and where it sits in the system. Plays a role in the performance and hence the performance modeling is a development design and operational interface
- Market segmentation: micro, residential, DG and utility --there are differences of course
- IGBTs don't really degrade (is this true?)
- A \$0.20 fan failure could actually be a \$2000 truck role (utility scale); other ways to cool

Observations and Issues

- Trouble shooting vs. swap out. The role of the tech is to get it up ASAP. It is a quality or reliability engineering function to determine the root cause.
- Many components may be sourced from overseas. Language is an issue. Interpreters! Asia can be expected to provide more products in the future.
- Cost reductions have been demanded of the industry and it has responded
- Warts, but continuous process improvement.
- It should be noted that collectively we've been a little loose with the definition of standards. Often it is meant in the broad sense to include everything from a spec to a test to a documented or recommended practice to guidelines and maybe an actually standard if it goes through some formal collaborative process