

Meeting Notes of the 2006 Wind Turbine Reliability Workshop

The 2006 Wind Turbine Reliability Workshop was held in Albuquerque on October 3 and 4 and hosted by Sandia National Laboratories in association with NREL and AWEA. This workshop helped to define primary wind turbine reliability issues as well as planning for the characterization and reduction of Operating & Maintenance (O&M) costs. A significant number of the 90 plus attendees were owners and operators. Other attendees were comprised of service companies, consultants, manufacturers, universities and lab representatives. Vestas provided four attendees and a message of continuous process improvement and other turbine manufactures were present. Over two dozen presentations were made ranging from hardware reliability (gearboxes, generators, pitch systems, blades, condition monitoring) to stakeholder perspectives (owners, operations, maintenance, user groups).

A memorable part of the workshop was when Mike Smith of enXco kept reiterating the importance of tracking, tracking, and tracking in repair and replacement of critical components and differentiating failure modes and documenting aging parameters. This formed somewhat of a motif of the workshop.

Two other major themes were interwoven throughout the discussions--data information sharing and the establishment of user groups to address pressing common issues. The American Wind Energy Association and the Utility Wind Interest Group have both initiated user groups and there may be a possibility of integration to address reliability issues. Roger Hill will develop a plan to address data collection, analysis, and reporting so that progress in reliability efforts, feedback to Research & Development and design can be made, and also suggest how user groups and Labs might function in that process.

Disclaimer: The following summary reflects key points made during presentations or discussions and may not reflect the view of all parties.

Design Related

- Wind “beats the hell out of” these machines and it is recognized as being a tough environment in which to operate
- It is impossible to control the environment in which components operate –a design consideration is to have allowed for all or most of the possible conditions
- Standards are critical as inputs to design and specifications but may not cover every possible event
- There is a wide range and variance of electrical component designs—is there a need for an AGMA-like standard?

- Remediation – closing the design loop – fixing the problem is a process that builds on reliability data
- Continuous process improvement in part comes from feedback (as well as testing and other actions)
- Gears are rated at a statistical 99% and bearings are rated at a statistical 90%. Is this an issue?
- There is a need for more advanced SCADA systems – SCADA systems that will lead to data manipulation and something that is more easily analyzed
- Reliability is at the center of the process to maximize lifetime economical performance
- There is a need to define the need for data in the supplier agreements

Operations and Maintenance

- Safety comes first!
- Climb assist devices or elevators can improve occupational health and retention of employees
- Levelized O&M costs can be 1.1 to 1.6 cents per kWh over 20 years
- Proactive O&M is less expensive than reactive
- We need to know where we've been, where we are, and where we are going with regard to reliability performance
- Tracking, tracking and more tracking – manage your assets – know what happened, failure modes
- How do we form a prediction of cost – so there can be confidence in expenditures related to O&M?
- Maintenance actions can reintroduce infant mortality!
- Data flows like a river. What data is available? A lot! 150 columns—The data must be assessed for what is relevant and for what purpose and level of importance

- Operators have a transition from a warrantee period to the post-warrantee period. This transition could be an issue with regard to continuity of O&M practices and tracking of information
- We don't have best practices documented and this could be an item for user groups to address

Analysis

- Not really known why some bearing fail and some don't
- We don't always have a root cause analysis for failures
- "Who needs to know " is a determinant for defining what is the fault, who needs to know about it, and what to do about it
- There is a need for more advanced SCADA systems – SCADA systems that will lead to data manipulation and something that is more easily analyzed (repeated)

Testing

- The fleet leader concept, where select machines are more heavily instrumented, may have some role in field testing and/or monitoring
- Testing of proposed fixes can be done in partnership with the Laboratories

Organizational

- Just look at gears—we have known about these problems—why hasn't system data been shared? This observation was made as an example of status quo where processes may be needed to make progress
- It is unclear to what degree there has been sharing of information with the OEMs--need to work with OEMs (and subcontractors)
- There is a need for data from the newer turbines
- Don't compromise the supplier/customer relationship (in whatever data sharing plans are developed)
- Combustion turbine user groups examined auxiliary equipment in addition to primary components
- UWIG has 6 user groups---O&M is one of them

- User group vision—what is it? Wind groups are new and organization is to be determined.
- User groups may be a way to share, info, spare parts, possible costs
- Users groups could come up with lessons learned
- Caution-- need a lubrication partner for gearbox consortium