

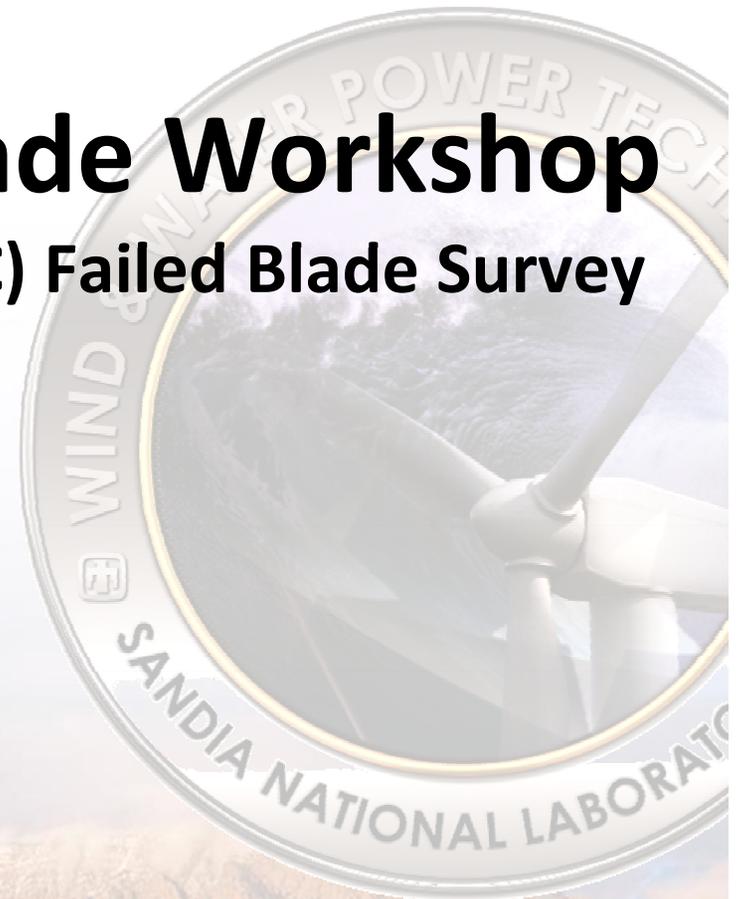


# 2010 Wind Turbine Blade Workshop

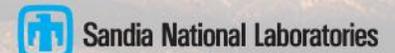
## Blade Reliability Collaborative (BRC) Failed Blade Survey

**Alistair Ogilvie**

Wind Reliability Data Lead,  
Wind & Water Power Technologies  
Sandia National Laboratories  
aogilvi@sandia.gov  
(505) 844-0919



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.



# ***BRC's Major Activities***

## ■ **Outcome of the BRC**

- Enable industry to deliver, assemble, and operate quality manufactured blades in the field, through *Design Analysis, Certification Testing, and both Factory and Field Inspection.*

## ■ **March 2010 Kickoff Meeting (Albuquerque, NM)**

- Failed Blade Survey – Tom Ashwill
- Inspection Validation – Dennis Roach
- Effects of Defects – Doug Cairns
- Analysis Evaluation – Joshua Paquette
- Certification Testing – Scott Hughes
- EPRI Collaboration – John Lindberg



# *Failed Blade Survey Data*

## ■ Goal –

- Define the kinds and severity of flaws and damage that have been found in the field, both before and during operation, and document the root causes

## ■ Process –

- Preliminary Survey of Operators
- Failed Blade Survey of Operators
- Repair Service Companies Data
- AWEA Operations & Maintenance Wind Turbine Working Group (O&M WTWG)



# *Preliminary Survey - 2008*

## ■ Operators of Five Plants

- ◆ Over 400 turbines
- ◆ Mostly 3+ years old
- About 80 Blade Replacements
  - ◆ 40 (half) at one plant
- Replacement Times
  - ◆ Range from 2 weeks to 2 months
- Blade Issues Cited
  - ◆ Manufacturing issues – waviness and overlaid laminates
  - ◆ Bad bonds, delamination, and voids
  - ◆ Leading edge erosion
  - ◆ Trailing edge splits
  - ◆ Lightning



# ***BRC Failed Blade Survey - 2010***

## ■ **Current State**

- Created Using Survey Monkey
  - ◆ **Web-based** survey tool
- Clear objective
  - ◆ Focused on blades
    - **Defects**
    - **Failures**
  - ◆ Focused on **operators**
- AWEA Members and Contacts
  - ◆ Backfill to **complete** survey data set
- 10 Questions
- End Date is July 31, 2010
- Analysis and Reports
  - ◆ High-level survey
  - ◆ Drive BRC work into the kinds and severity of flaws and damage



# BRC Failed Blade Survey - 2010

## ■ Areas to Note

- Repair
  - ◆ Manufacturing and Transport
  - ◆ Installation
  - ◆ Operation
- Replace
- Further Contact Question



# *Other Sources of Data*

## ■ Repair Service Companies Data

- Building Additional Partnerships
  - ◆ Non-Disclosure Agreements
    - Aggregate before reporting

## ■ AWEA O&M WTWG

- Support the “Best Practices” guidelines
  - ◆ Wind Turbine System survey

## ■ Large enough data set

- ◆ Representative
  - Technology
  - Geography
  - Operators



# BRC Database

Increasing  
Breadth

Portion of National Fleet

NERC – GADS  
Wind Turbine Generation

Continuous Reliability Enhancement  
for Wind database (Sandia)  
&  
ORAP for Wind Data  
(SPS)

Gearbox Reliability Database (NREL)

Blade Reliability Database (Sandia)

Increasing  
Detail

Grid

Plant

Turbine

Sub-Systems

Components

Parts

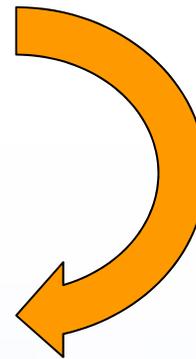
Physics



# Survey Data – Step ONE

## ■ Data Gathered

- Statistics
  - ◆ Operators
  - ◆ Repair Services Companies
  - ◆ AWEA
- Identify Root Cause
  - ◆ Operators
  - ◆ Manufacturers



## ■ Support Other Aspects of the BRC

- Inspection Validation
- Effects of Defects
- Analysis Evaluation
- Certification Testing
- EPRI Collaboration



# ***BRC Failed Blade Survey Data***

- **Survey Developed and Delivered**
  - AWEA Support
  - Participation Closes 31<sup>st</sup> July 2010
- **Only Step ONE**
  - Target Relevant Failures and Defects
  - Identify Operators
    - ◆ Partnerships
- **Next Stage**
  - Root Cause Forensics and Analysis





***Thank You***

