Reliawind Field Study

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2009 Wind Turbine Reliability Workshop
Albuquerque, NM, 17-18 June 2009
Garrad Hassan Around the World

- Founded in 1984 in UK
- Now have offices worldwide
- Local understanding informs global perspective

350 professionals
25 Offices
Asset Management and Optimisation Services (AMOS)

- Performance Monitoring
- Fault diagnostics and forensic analysis of SCADA data
- Post-construction energy forecasts
- O&M advice
- Warranty calculations
- End of warranty inspections

20 GW of operating plant assessed worldwide
Summary of Reliawind

- EC funded R&D project
- €7.7M total funding
- €5.5M EC funding
- 10 organisations involved
- 3 years

Aims:
- Improve general understanding of wind turbine and farm reliability
- Develop reliability models specific to wind turbines

- Increase MTBF
- Decrease MTTR
- Increase availability
- Decrease CoE

Important Onshore → Critical Offshore
Summary of Reliawind

Main project work packages:
1. Field data reliability analysis
2. Design for reliability
3. Algorithms for condition monitoring
4. Proof of concept
Previous Work – Availability

Distribution of annual availability

- "Standard" long-term availability assumption ≈ 97%
- 50% of wind farm years with availability 97.5% or higher
- 99% of wind farm years with availability of 80.0% or higher
- 90% of wind farm years with availability of 92.5% or higher
- Mean = 96.4%

Database:
- Over 250 wind farms worldwide
- All major manufacturers
- Over 1000 wind farm operating years
- Operating from 1 to 15 years

Source GH, presented at EWEC 2008
Previous Work – Reliability

Courtesy of Durham University
Previous Work

- Previous availability work limited to high level availability and fault information
- Previous reliability work limited by quality of data
- Need better quality data to get better results…

Reliawind Field Study
Data Available from a Wind Farm

- 10 minute average turbine and substation SCADA databases
- Fault logs per turbine and substation
- Manual records
- Work orders
- Monthly operational reports compiled by the operator and or manufacturer
Reliawind Common Formats

Turbine taxonomy
A common approach to describe wind turbines from different manufacturers

Database
A common method to store downtime events and their origin
Reliawind Initial Results
Results – The Story so Far

Data sources:
- Manufacturers – Consortium members
- Owners & Operators – Users’ Working Group

Data added so far:
- 290 turbines
- 240 wind-farm months
Results – Failure Rate

Percentage contribution to overall failure rate
Data source: turbines from multiple manufacturers
Results – Downtime

Percentage contribution to overall failure rate
Data source: turbines from multiple manufacturers
Results – Reliability Profile

- Power Module
  - Generator
  - Rotor Module
- Pitch System
  - Control
  - Nacelle
  - Unknown
  - Structural Module
- Your Site

- Generator
  - Hours Lost [hrs / Turbine / Year]

- Power Module
Concluding Remarks

• Reliawind addresses the need for a quantitative measurement and understanding of turbine reliability

• Common standards defined – turbine taxonomy and data structure

• Database populated with data from 290 turbines

• Database growing!
Thank You

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