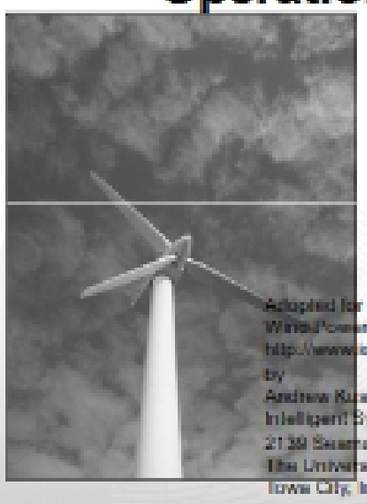
SCADA Data Mining and IT Needs to Improve Plant Operation and Downtime



AWEA Wind Power Asset Management Workshop

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SCADA Defined

- Supervisory Control and Data Acquisition system
- Actual definitions and descriptions can vary – some skip the "supervisory control" part and just handle the data side
- Projects need data analysis, not just acquisition

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Three Levels of SCADA Systems

- Systems focused on site operations
  - Primarily systems provided by turbine manufacturers
- Systems focused on project-level analysis
  - Primarily small-scale, third-party systems
- Systems designed for enterprise-level, fleet-wide analysis
  - Almost exclusively third-party systems, especially when handling multiple turbine types

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What They're Generally Best At (Although All Systems Vary)

Task	Manufacturer's Project SCADA	Third-party Project SCADA	Enterprise SCADA
Day-to-day project operations	Best 😊	Good 😐	Fair ☹
Month-to-month project performance analysis	Fair ☹	Best 😊	Good 😐
Evaluation and comparison of entire wind portfolio	Poor 💣	Fair ☹	Best 😊

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Why Use Third-Party Systems?

- Provides common system and interface when mixing turbine manufacturers
- Generally more customizable for reporting and analysis purposes
- Provides independent measurements and analysis – the system calculating availability will not be designed by the people who have to pay for low availability
- Frequently more functionality and data storage

Why Not Use Third-Party Systems?

- Often redundant to some extent, if turbine manufacturer requires use of their SCADA for O&M/warranty purposes
- Can be more difficult to get full access to systems for data collection purposes
- Value of analysis tools is limited by quality of data going in
- Cost (perceived or actual)

Hardware and Software Needs – On-Site System

- Most manufacturer's systems are turnkey installations
  - Controller/interface at each turbine or other monitoring point
  - Fiber optic cabling or wireless communications across project
  - Centralized server at operations building

Hardware and Software Needs – Telecommunications

- Security important for control: crucial that unauthorized users not control turbines!
- High-speed, reliable Internet access required for efficient data transmittal
  - Typically, T1 speed and reliability necessary
  - DSL/cable problematic due to speed/availability issues
  - May not be cheap to get wiring to remote sites

Telecommunications (Continued)

- Project-specific needs:
  - Data transmittal to utility
  - Data transmittal to forecasting services
  - Internal presentation
  - Public presentation

Hardware and Software Needs – Off-Site/Enterprise Systems

- **Lots of Storage**
  - Data need to be readily available in order to be useful
  - Desktop-type database systems generally inadequate for management of long-term data
  - Large project can generate many GBs of data/year – multiply by several projects and several years
  - Data backup system is (of course) important

What Can be Learned by Mining SCADA Data?

- Verification of turbine and plant performance
- Assessment/prediction of failures
  - Predictive maintenance of large components (including condition monitoring)
  - Evaluation of faults and minor components
- Quantification of effects of problems and prioritization of efforts to solve problems
- Warranty claim support

Objective: Optimize Operations to Maximize Profit

- … not turbine availability, energy production, or project revenue, if at the expense of cost or effort
- On-site operations are frequently driven by reactions to short-term problems and may not reflect the best overall strategy