

# Advancing Wind Power in Illinois-Emerging Technologies

GE Intelligent Platforms  
Proficiency SmartSignal



imagination at work

# Agenda

What is GE Intelligent Platforms & Proficy SmartSignal?

What do we do?

What are we doing for the Consortium?

# Proficiency SmartSignal

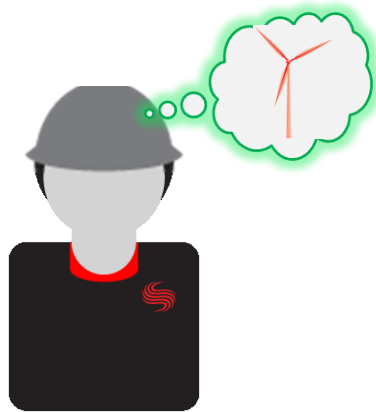
- ❑ Algorithms originated at Argonne National Laboratory in the 80's
- ❑ SmartSignal formed in 1999, Headquartered in Lisle, IL
- ❑ Started the Predictive Analytics market
- ❑ Steady growth
  - in Power – about ½ of US power gen (by MW) uses SS
  - and O&G industries – North Slope, GOM, refineries, midstream
- ❑ Acquired by GE Intelligent Platforms in January 2011

# Predictive Analytics

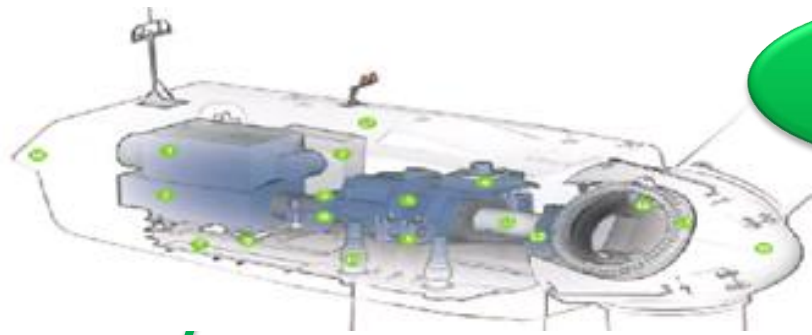
Acts as a Supporting Experienced Operator & Technician

Leverages Past Experience...

Works 24x7



# The Proficy SmartSignal Solution



Starts with Data from Your Equipment

MAIN INCIDENT VIEW LAST OUT +

hierarchy explorer incident view

ALL ON WATCH

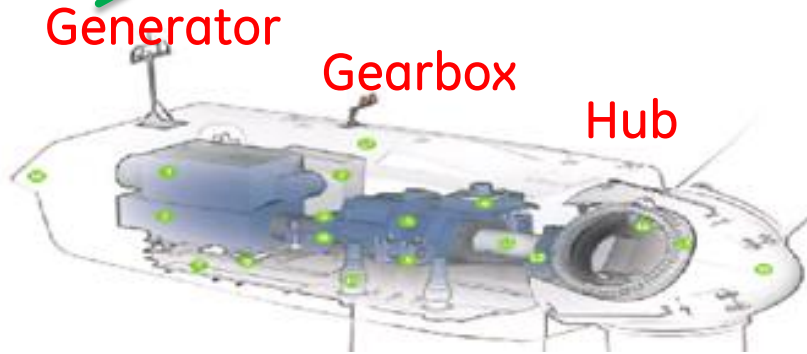
Plant 1

- Unit 1
  - Air Heaters
  - Mills
    - MILL U1A
      - MILL\_RUNNING PERFORMANCE
    - MILL U1B
  - Turbines
  - Feedwater Heaters
  - Generators
- Unit 2

SHOW: New Acknowledged Deferred

DRAG A COLUMN HEADER HERE TO GROUP BY THAT COLUMN

ASSET	INCIDENT MESSAGE
MILL U1A	MILL_GEAR_REDUCER_INBD_BRG_TEMP - Mill 1A Speed Reducing Lo Speed Shaft Inboard B...
MILL U1A	MILL_GEAR_REDUCER_OTBD_BRG_TEMP - Mill 1A Speed Reducing Lo Spd Shaft Outboa...
AIR HEATER U1A	SUPPORT_BRG_LUBE_OIL_TEMP - PREHTR SPRT BRNG OILTEMP HIGH
AIR HEATER U1A	AH_AIR_OUTLET_TEMP_3 - AH EAST PROBE 1 HIGH
GENERATOR U1	STATOR_TEMP_15 - STATOR GAS DELTA TEMP HIGH



Personalized Empirical Models

Pulls every 5-10 minutes

DIAGNOSIS: Bearing Wipe  
Unit 1, Turbine Shaft

Removes the Effects of Changing Conditions



Proficy SmartSignal

Posts Emerging Problems to Incident List

# Models Focused On Failure Modes

## Detect Blade Pitch & Yaw Failures:

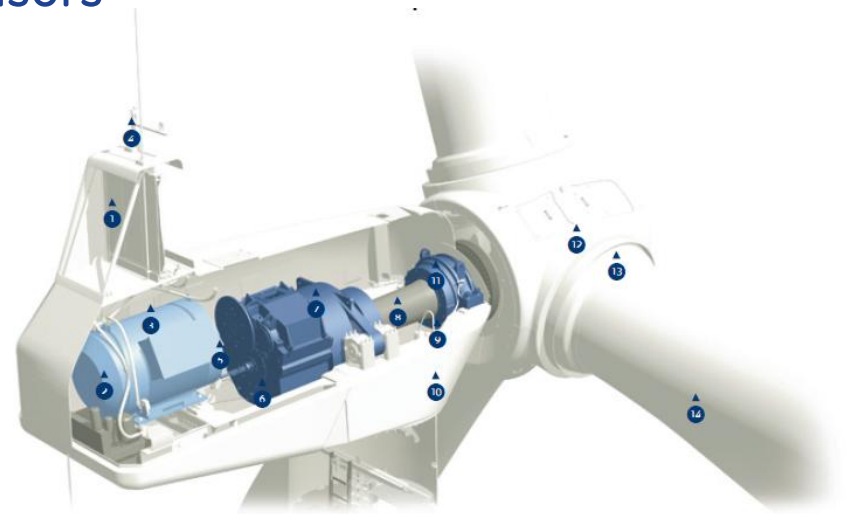
- HUB model: typically 17 sensors

## Detect Gearbox Failures:

- MECHANICAL model: typically 17 sensors

## Detect Voltage/Current Failures:

- GENERATOR model: typically 19 sensors



# IIT - Invensys - SmartSignal Wind Project

## Phase 1

- Install IT Network and Servers at Invenergy and IIT.
- Install Proficy SmartSignal Software at IIT
- Create and activate models for 1 wind turbine utilizing the existing available sensors.
- Install a local camera to visually monitor turbine condition and environment

# IIT - Invensys - SmartSignal Wind Project

## Phase 2

- Identify and Install additional sensors that would enhance condition monitoring capabilities.
- Modify the models to include additional sensors.



# Additional Instrumentation

## Vibration

- 6 High Frequency Accelerometers
- 6 Low Frequency Accelerometers
- Signal Processing / Data Acquisition Box
- Bentley 3701 Wind Turbine Monitor

## Lube Oil

- Pressure and Temperature Instrumentation
- Particulate Counter
- Data Acquisition Box

## Blade Pitch Motors

- Current and Voltage Instrumentation
- Stator Temps
- Data Acquisition Box

# Example Report

SmartSignal Monitoring Report

5/19/2010



Availability & Performance Center

Gearbox Temp and HS\_BRG\_TEMP\_2 are about 10 degrees high

Status:

Date of Notification:

Equipment Tag: GEARBOX\_TEMP,

HS\_BRG\_TEMP\_2

Category:

Description:

The GearBox Temp and High Speed Bearing Temp 2 tags are running about 10 degrees higher than the sister turbines.

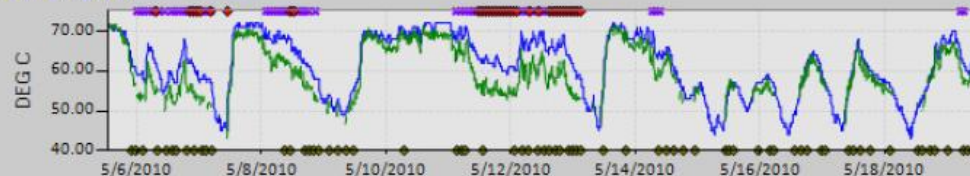
Diagnosis:

Continue to watch closely, could be indication of lube oil cooler issue...

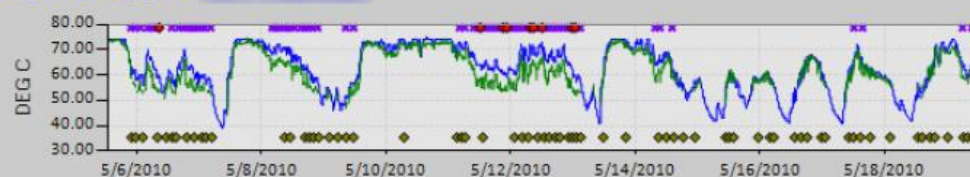
Customer Response:

Possible Sticky Thermostat is preventing enough lube oil from being routed through the radiator

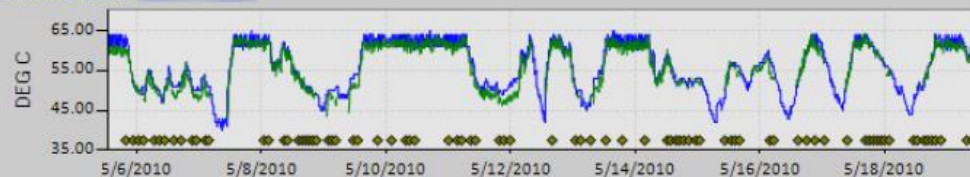
GEARBOX\_TEMP



HS\_GEAR\_BRG\_2\_TEMP



GEARBOX\_TEMP



GEARBOX\_TEMP



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## Monitoring Software Demonstration

