

## Approach to Cost Analysis

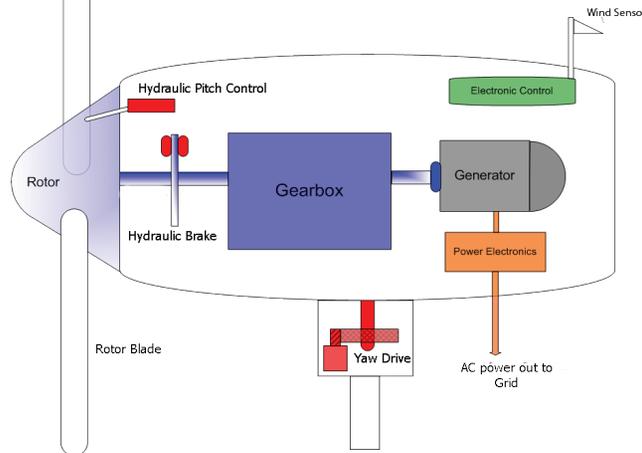


## Sponsor Background



SmartSignal Inc. Offers software which models machine and equipment behavior, and can learn to distinguish between normal and abnormal conditions. This information is used by machine operators to pro actively deal with potential problems before they cause faults and unplanned downtime. It can also be used to determine when preventive maintenance is actually needed, which can reduce costs by limiting unnecessary maintenance. It does not currently deal with the wind power industry, but views this area as a potential future market for its products. Developing this market will require an in-depth understanding of the nature of equipment failures and industry maintenance practices, including all economic costs.

## How a Wind Turbine Works



- **Brake:** Stops the rotor in an emergency.
- **Gearbox:** gears connect the low speed shaft to the high speed shaft and help increase turbine speed (30-50 rpm to 1000-1800 rpm), as required by the generator for efficient generation of electricity.
- **Nacelle:** it sits on top of the tower and includes the gearbox, high and low speed shafts, generator, controller, and mechanical break system.
- **Pitch:** Blades are turned out of the way of the wind direction when wind speeds are too high or too low for optimal functioning.
- **Yaw Drive:** Its function is to orient the turbine in the direction of the prevailing wind. A yaw motor powers the drive mechanism.
- **Vane:** Its function is to measure the wind direction and communicate to the yaw mechanism so as to orient the turbine properly in the direction of the wind



The Picture on the left is inside the tower of a wind turbine at the GE wind farm in Illinois. This station has various machines that control the individual turbine. The power from each wind turbine goes to a converter box and then get connected to the main electric line.

## Team Structure

**Team Leaders:** Donald Ruffatto, Earl Fairall, Edmund Feldy PE

### Phase 1

- Research Team:** Learn how turbines work . Find out what are the major faults and failures.
- Contact Team:** Contact operators, owners and third party maintenance people to schedule interviews.
- Questionnaire Team:** Create interview questions for the contact team based on research.

### Phase 2

- Contact Team:** Continue work as in phase one.
- Spreadsheet Team:** Create an interactive cost analysis spreadsheet based on research.
- Deliverable Team:** Create final IPRO deliverable and IPRO day materials.

## Ethical Issues

SmartSignal operates in a competitive market and any classified or sensitive information or documents obtained from SmartSignal will be kept confidential and will not be disclosed to anyone outside the project team. SmartSignal has requested that we not mention their sponsorship of IPRO 303's project when gathering information. The team feels that nondisclosure between SmartSignal and the companies the team interviews and visa versa is the best way to handle this issue

The team is looked into this issue from 3 different perspectives. One is the ASME code of ethics. The second one is from the point of view of the book *The Seven Layers of Integrity*. The third and final perspective is from a summary of a reading called *Ethics, it's Good Business*. Each team wrote a short summary of their perspective. The team decided to redact the contact information from the sponsor.