

## Green Power Part 1 — Wind Turbines

### Wind Turbine Basics

### Multidiscipline Damage Engineering



## Cause Cost Downtime

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# Damage Engineering INSIGHTS

commercial • energy • infrastructure • manufacturing

This is the first of a series of *Insights* that focus on cause, cost, and downtime aspects of damage to alternate sources of power. Wind turbines are a rapidly growing sector of the power generation industry. We are encountering a higher frequency of damage to this type of equipment because there are many more wind turbines generating electrical power.

### SOME WIND TURBINE BASICS

Spinning air foil-style blades (they look like airplane propellers) of wind turbines convert wind power to electrical energy by turning a rotor, the gearbox, and electrical generator. These units are controlled electronically, often remotely, to align the blade angle and rotor positioning with wind direction and speed to optimize the performance of the turbine.

Wind turbines are usually grouped together in a “wind farm” strategically located in the path of prevailing wind patterns.

The base station where the units are controlled may be several miles away.

### Cause

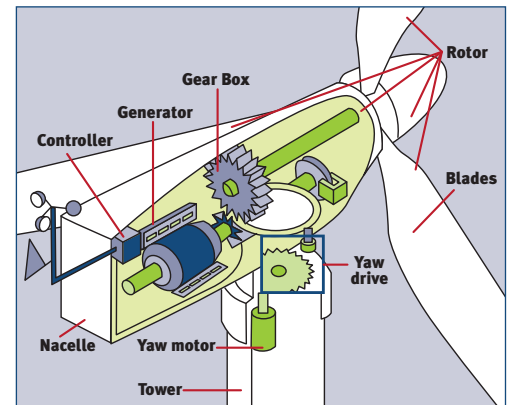
One can expect to encounter a variety of situations that can cause wind turbine damage. Excessive wind speed and manufacturing defects are common sources of blade damage. Minor damage can become major damage if the blades are not in alignment with the wind. This can occur when power is interrupted to the turbine’s controls.

Spinning blades can contain a lot of rotating energy (inertia)—damage to spinning blades can cause tower damage necessitating extensive repair or even replacement of the entire unit (tower, generator, gearbox and rotor system).

Electrical failure of the controls, generator or transformer (all mounted within the turbine’s nacelle) can also lead to significant damage to the unit.

### Cost

- Currently the typical wind turbine you will encounter will cost one to three million dollars installed
- The generating capacity of units being produced tend to range between one and three megawatts
- The average installed cost per megawatt is one million dollars



### Downtime

The demand for wind turbines is extremely high and we expect this section of the power generation industry to continue to show significant growth.

Repair periods can take longer than the more mature gas turbines sector:

- Component replacements can be delayed 1–2 months due to the wait for calm enough conditions to do the work, typically from crane supported buckets
- The components are often manufactured overseas and are typically only available from the original equipment manufacturers—expect 1–2 month lead times or more

### Multidiscipline Damage Engineering

Wind turbines can involve several engineering disciplines. You may need to consider:

- Structural for the towers
- Mechanical for the blading and other rotating components
- Electrical for the unit’s generator, and the farm’s electrical apparatus like transformers, switchgears, and electrical turbine controls

Call us when you need equipment or building damage engineering investigations into the cause, cost, and downtime aspects of commercial, manufacturing, energy, infrastructure, and technology damage.

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