



The Impact of Rapid Industry Growth on Blade Reliability

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With thanks to Andrew Bellamy

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The True Cost of Blades

THE WALL STREET JOURNAL

October 24, 2008, 9:41 am

Wind Breakers ██████ Shudders After Wind Turbine Accident

Posted by Keith Johnson

Wind power companies are not having a good week. Just after shares in Spain's Gamesa [went south](#) on production fears, shares in ██████ plummeted 39% Friday after a blade broke on one of the company's U.S. turbines. [That accident](#) comes after a series of technical and financial mishaps that have dogged Suzlon in recent months. [Tom Wright reports in the WSJ:](#)



Wind shear (Karen Newby/Journal Star)

The accident is the latest and most serious in a series of blade splitting and other technical problems in the U.S. and India which have hurt ██████ image. The share-price decline Friday also reflected investor concerns that ██████ will be unable to raise the money it needs in coming months to fund an ambitious global expansion plan, and may be forced to sell assets, analysts said.

██████ has gotten plenty of attention for its [turbine troubles](#)—and it has suffered from turbine breakdowns, cracked blades, and turbine underperformance that have driven customers to cancel orders—but it isn't entirely alone. All turbine makers have at one time or another have wrestled with technical glitches in the complex machines. Vestas of Denmark, the world's biggest turbine maker, has had a few turbine failures as well. A Siemens turbine collapsed last summer, killing a worker in the U.S. Other power sources, such as nuclear power, are still dogged by safety scares, like the [evacuation](#) this week of the Vermont Yankee reactor, or the [conviction](#) handed down in the case of an Ohio nuclear plant that had a hole in it.

But as wind power has moved from a fringe source of power to one of the world's fastest-growing sources of new electricity, scrutiny is increasing. And now that the short-term outlook for renewable energy, especially wind power, is clouded by the credit crunch and the economic slowdown, turbine makers' woes only fuel the flames.

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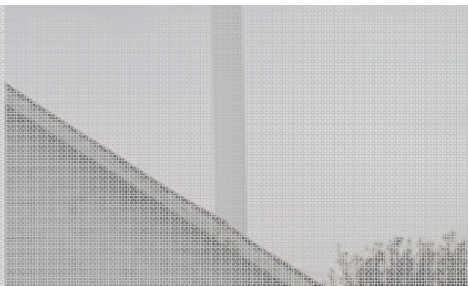
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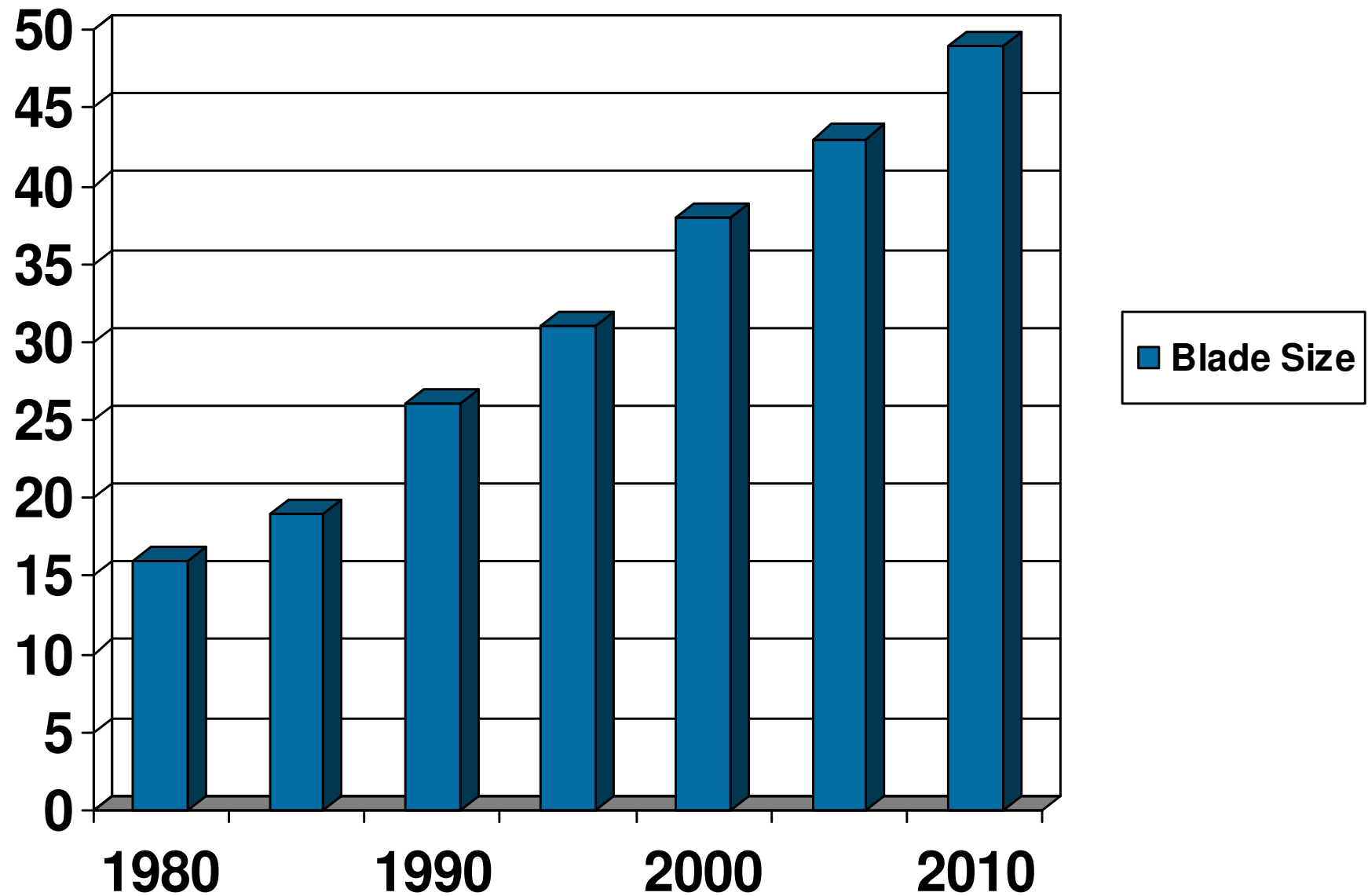


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Blades – a brief history...



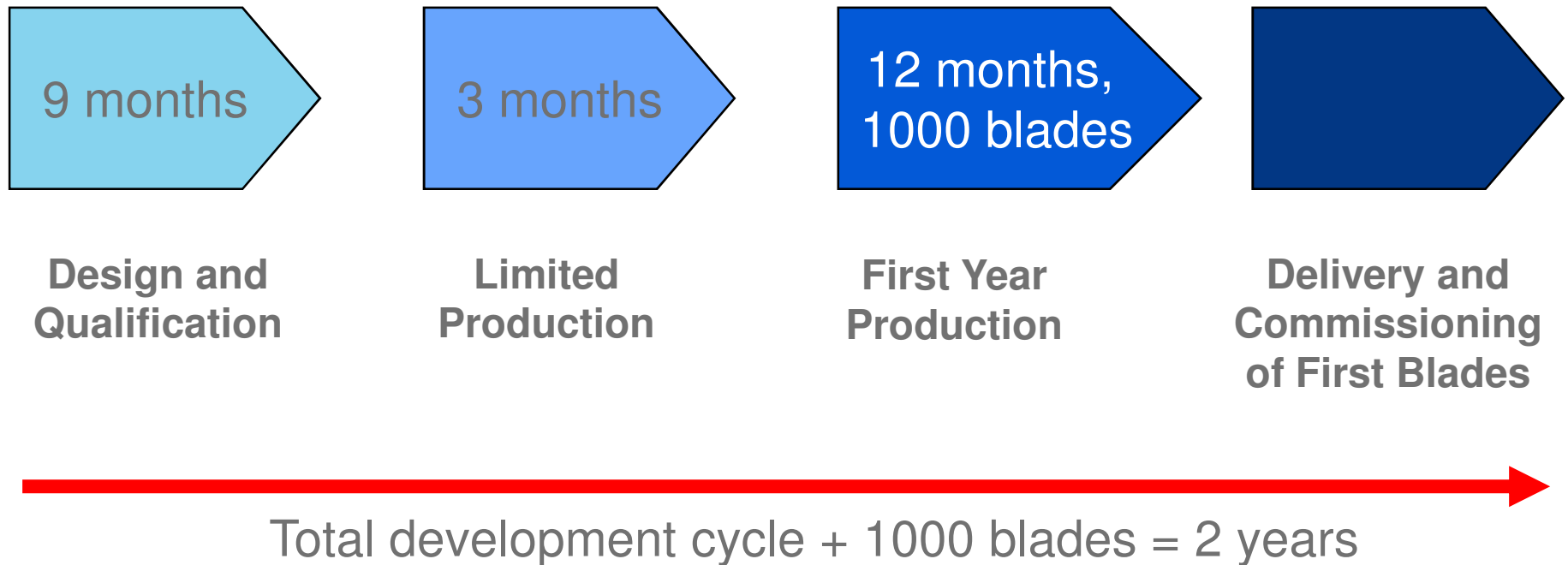
Rotor Blade Life (40m)

- **During its life, a 40m blade will:**
 - **Be built in less than 24 hours by operators with frequently less than 12m experience in blade building**
 - **Travel an average of 2000 miles (on other transport) before being mounted**
 - **The tip will cover 4300m (14200ft) every minute at a speed of 260kph (170mph)**
 - **Tip will travel 45,201,600,000 meters (45million Km)**
 - **Survive 20 seasons (often in extreme environments)**
 - **Receive almost no maintenance, service or cleaning**

Market Pressure

- We are a relatively new industry
- Composites in this scale are new
- For modern turbine manufacturers, the push for technology demands new blade designs almost every year
- Pressure from market forces the entire design and development process to be reduced to the minimum

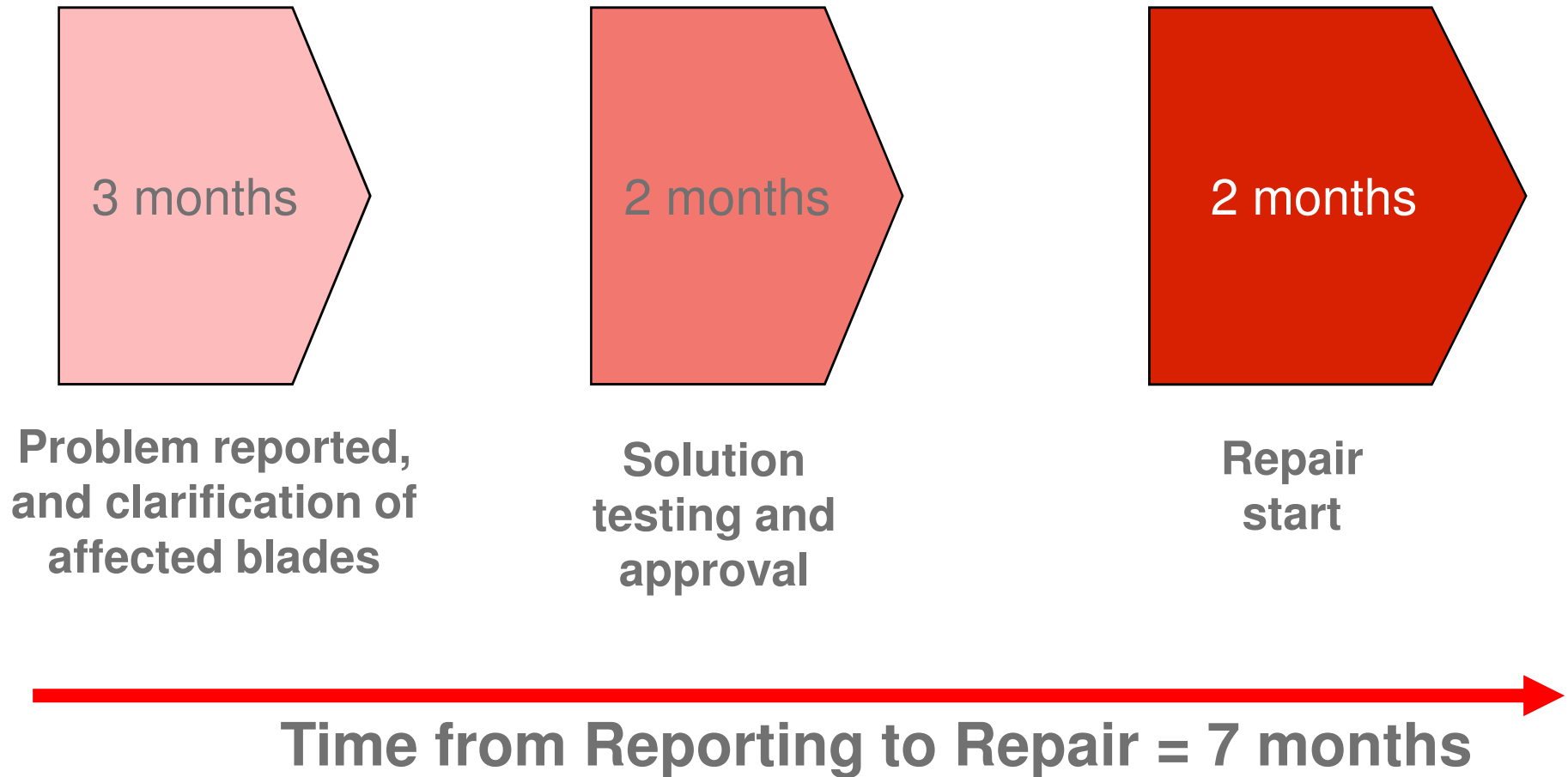
The Typical Blade Development Situation



Engineering Limitations

- After 24 months a new blade has been developed and 1000 have been delivered to site and are flying
- Imagine a problem is now reported
 - Design
 - Structure
 - Materials
 - Manufacturing
 - Quality

Problem Reported



Engineering Limitations

- From first manufacturing to beginning of repair has taken 19 months
- During this time potentially 1585 blades have been made and are now in need of repair
- These could (and generally are) distributed to remote sites, in a variety of countries
- Infrastructure for repairs is limited

Challenges for blade producers

- Drive for low cost
- Blade production can be very variable
 - Blade weights
 - Blade moments
 - Laminate quality
- Large differences between “qualification” blades and actual production blades
- Large differences between quality of materials used with different manufacturers
- Processes like resin infusion are harder to master than they first appear

Challenges for blade producers

- **Composites are not metals...**
 - **Materials are formed as structure is built**
 - **Globally low skill base on composites**
 - **Difficulty in transferring skills from other industries**
 - **Materials are generally custom-made**
 - **Quality can be difficult to determine**
 - **Composites hate anything but well-controlled manufacturing environments**

Challenges for blade producers

- **Factories manufacturing blades are appearing across the world in “suitable” sites**
- **Generally unskilled workforce with no knowledge of composites from the beginning – and limited training**
- **Global dispersion and required “local” manufacturing lead to products varying by site – leading to confusion when problems occur**
- **High demand for blade output from day of start-up**
- **Slow realization (and response) to problems**
- **Very few specialists to help– and those that exist are very stretched**

Conclusions

- **We can expect more blade failures in the field over the coming years**
- Turbine buyers and owners should apply pressure to their suppliers to provide the optimum cost/reliability mixture – not just the cheapest blade option
 - *Know your blades and understand how they're made*
 - *Take advice on manufacturing methods, materials and engineering.*
 - *Demand quality and consistency of manufacture*
 - *Ensure blades are thoroughly checked before they leave factories*
 - *Accept that mature blade solutions take time to develop but are worth paying the extra for*

Make sure reliability is the key factor, not price – because any major rework or repair is likely to remove the profitability of a turbine for a long time, if not forever.

