

Turbine Blades From Ground Level

3rd Annual Sandia Blade Workshop
Albuquerque, NM
May 12, 2008

Presented by Gary Kanaby



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Service Company*

Topics

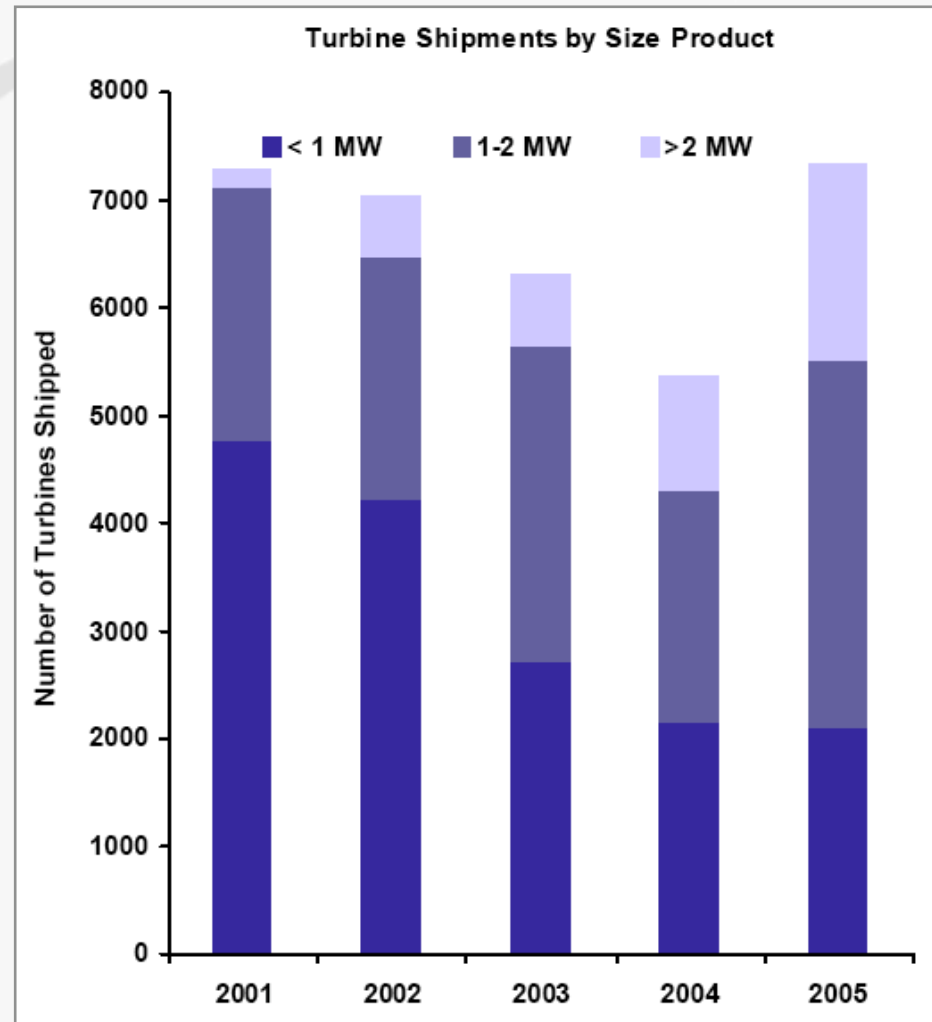
- New Blades
- Blades in Service
- A Blade of the Future



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Turbine Size

- Market is shifting towards larger turbines
- Less than 1 MW market has declined substantially since 2001

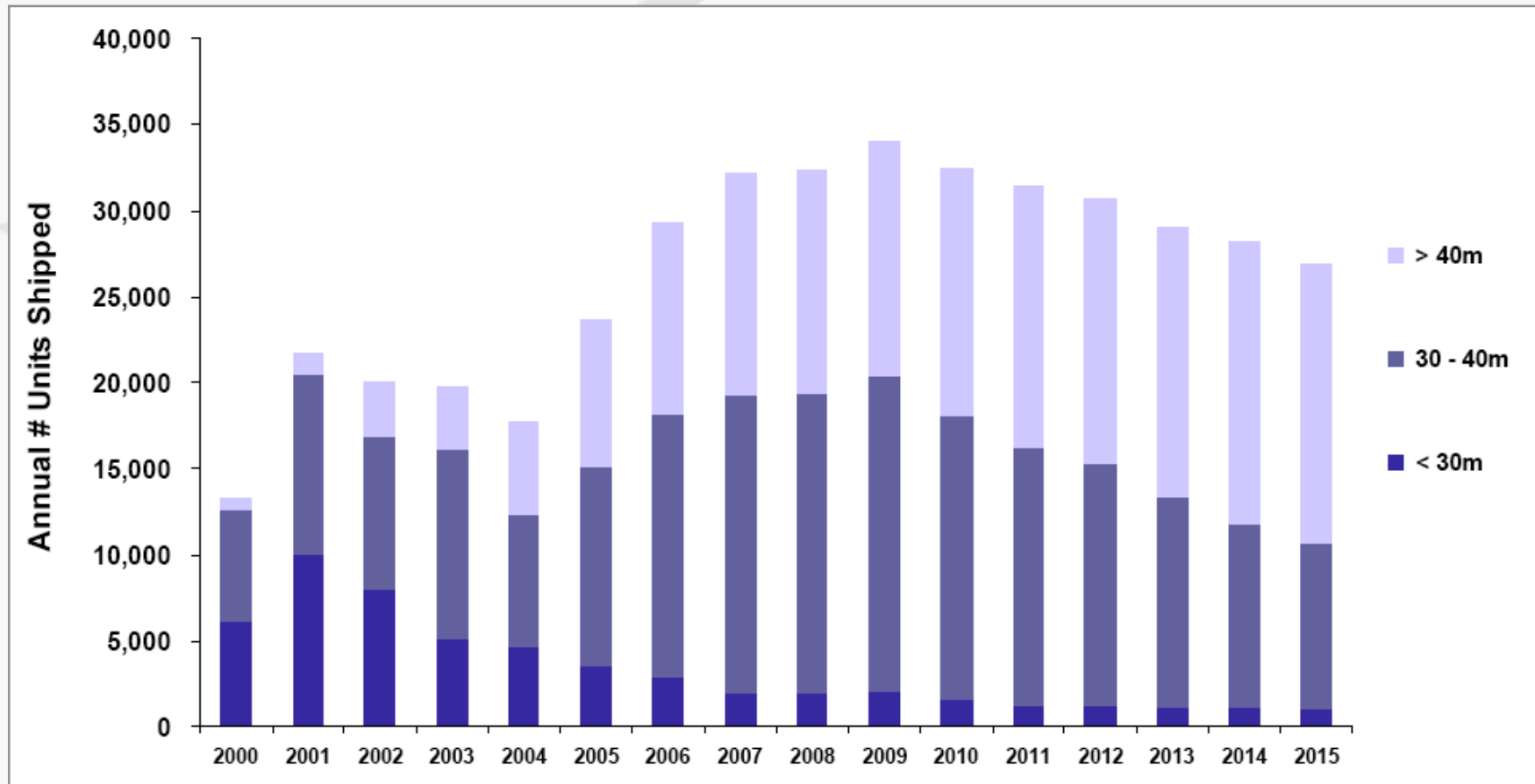


Source: Emerging Energy Research, 2006



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Blade Shipments Size

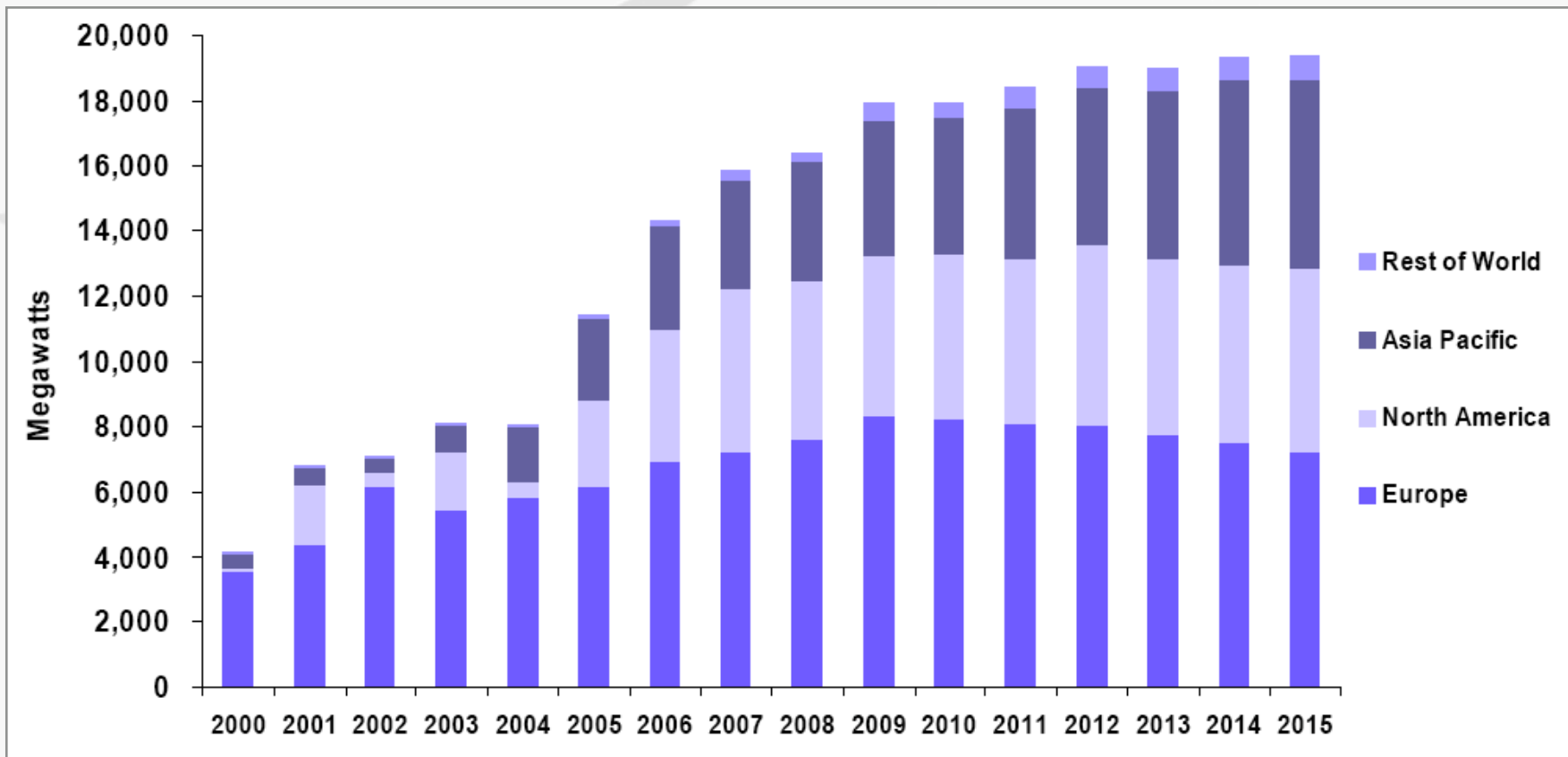


Source: Emerging Energy Research, 2006



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Projected Market Growth



Source: Emerging Energy Research, 2006



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Scaling Up is not Easy



- Spar Bonds-Harder to control for large blades
- Dry Spots-Infusion not complete
- Wrinkles-Glass moves when vacuum is induced

All Process Issues



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Causes of Accelerated Production

- Market Demand
- Are the PTC's Expiring?
- No time for long field testing
- No time for long fatigue test
- Scaling up is not easy



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Transportation Damage

Blades are built far from the Sites

Factory → Truck → Ship → Truck → Site



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Solutions to Blade Problems

- Blades can be infused in one piece eliminating the bonding process
- Blades can be built out of smaller subcomponents
- Build a two piece blade that can be shipped more easily
- Portable blade factory-blades built at the site



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Upgrade Quality Control Control

- Document Changes
- Bond line measurements
- Ultra-Sound
- Thermography



Thermographic Camera



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For Existing Wind Turbines... A Service Plan!

Objectives:

- Increase availability
- Minimize downtime
- Reduce/eliminate large repairs and replacements
- Increase productivity



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Process

- Service is scheduled
- Technicians arrive
- Initial meeting
- Report
- Repair
- Documentation



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Choosing the Blades to Inspect

- Blades reported noisy
- Blades observed with suspicious marks/cracks
- Low production machines
- Turbines suspected of lightning hits
- Random sampling



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Inspection Techniques

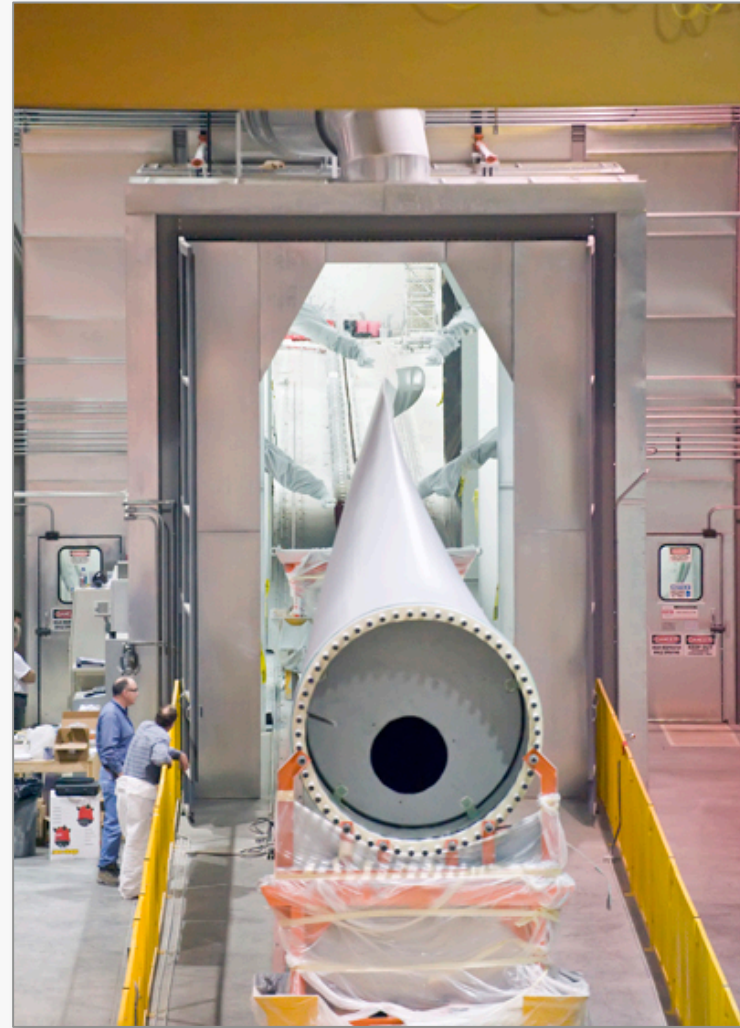
- Visual inspection
- Tap test
- Infrared imaging of suspect areas
- Photography
- Lightning system continuity check
- Inspection documents produced



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