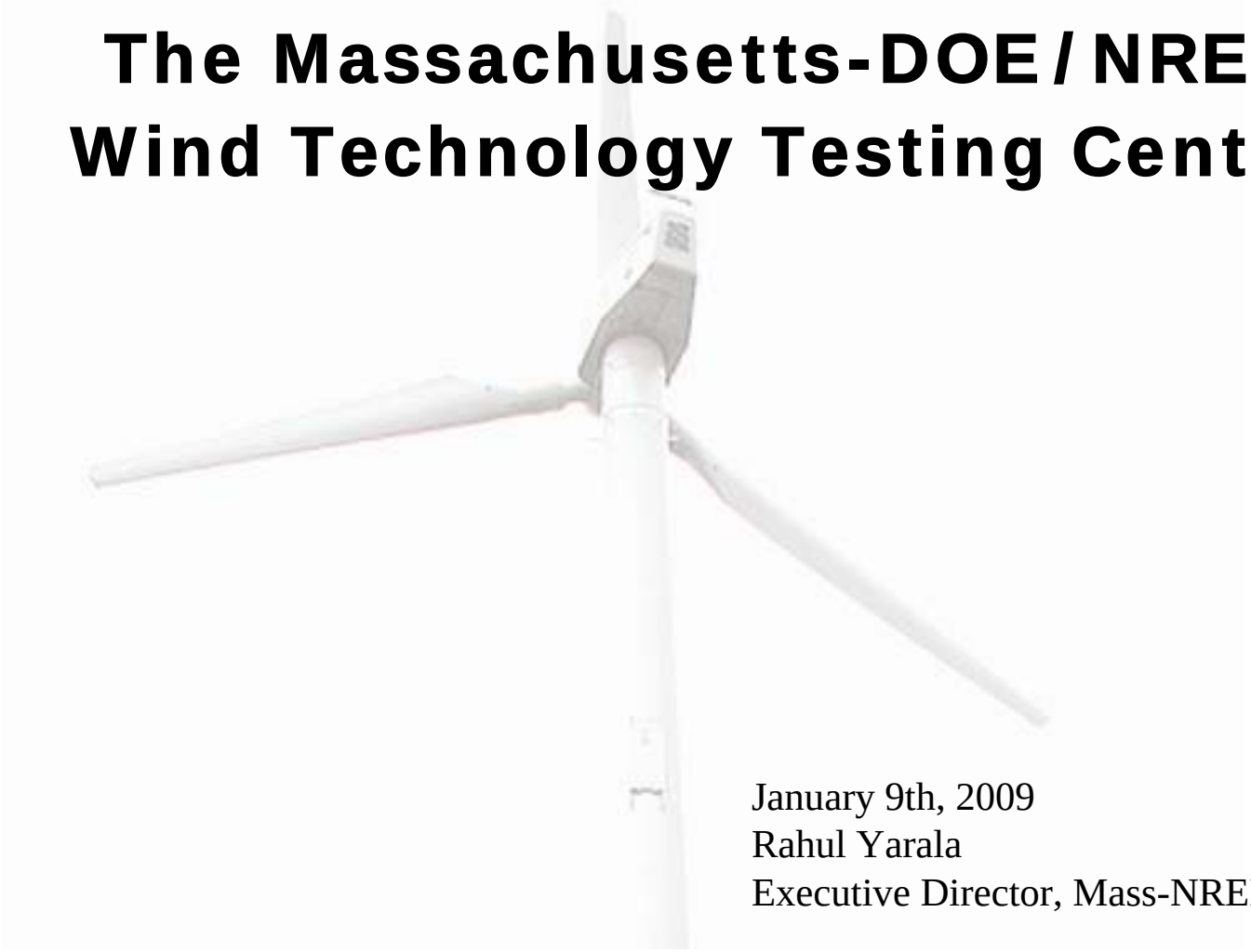
The Massachusetts-DOE/NREL Wind Technology Testing Center



January 9th, 2009
Rahul Yarala
Executive Director, Mass-NREL WTTC

Wind Energy Outlook

- Land based Wind Energy installations growing at high rates (~30%); recent financial crisis will slowdown the growth but 10 year growth rate predictions are still high at **20%+**.
- Large US market size attracting new European, Asian wind turbine manufacturers into US.
- **Huge off-shore wind energy potential** for Northeast USA. Load nearby the generation, high capacity factors, shallow waters make for several economically feasible sites.
- Apart from permitting and community approval issues; **wind turbine reliability** is the biggest concern for large scale off-shore wind energy development.
- Off-shore Wind because of Balance of Plant costs will require large (5MW+)turbines to keep COE low.

Wind Turbine Blade Testing- Potential

- 2007 estimated blade production was 43,777 and is predicted to grow by factor of 3.2 to 140,864 blades in 10 years
- Higher costs and lower than predicted effective lives for components, including blades, is raising the bar for manufacturers to **further test and improve reliability**
- Int'l certification standards are changing to **require more testing**, including endurance/fatigue testing, manufacturing audit testing and new lines/supplier tests
  - IEC 61400-23 now requires fatigue testing as part of certification. GL, DNV uses the IEC standard. Design certification is a requirement for project financing and insurance.
  - Contentious due to length of program and conservative assumptions in the application

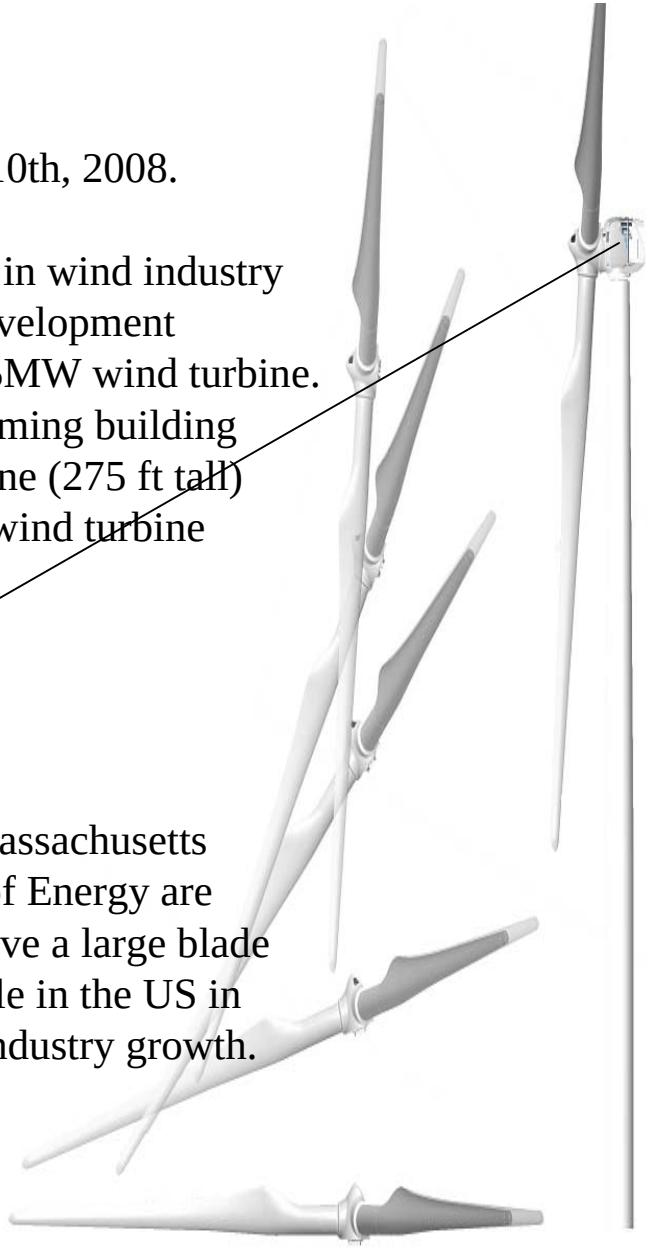
Larger blade testing facility in MA

Blades now longer than older U.S. facility can test
Significant increase in US wind energy installations,
Reliability problems (blade problems are significant)
Off-shore Wind is driving larger and newer wind turbines requiring more rigorous testing

•Rahul Yarala started Nov10th, 2008.

•Over six years experience in wind industry
•Mechanical design and development
of the Clipper's Liberty 2.5MW wind turbine.
•Spent two months in Wyoming building
the first 2.5MW wind turbine (275 ft tall)
•Worked with most of the wind turbine
and blade manufactures

Commonwealth of Massachusetts
and US Department of Energy are
fully committed to have a large blade
testing center available in the US in
support of the wind industry growth.



WTTC: A Best-in-Class Facility

- **Create the most functional, most flexible blade testing facility in North America, if not the world**
- **Develop an institution integral to the U.S. wind industry, and a gateway to the U.S. market for international firms**
- **Key facility for US off-shore wind turbine technology and turbine development**
- **Serve as cornerstone of a wind technology design and manufacturing cluster in Mass., focused on offshore.**
- **Create more Green Jobs!**
- **Short-term construction jobs in Boston!**

Core Capabilities at WTTC

- 2(expandable to 3) test stands capable of testing 70m to 90m wind turbine blades.
- Full suite of static and fatigue blade tests
- R&D iterative testing (new designs&materials)
- Manufacturing/QA testing (audit) prior to deployment or after repairs