MA Large Blade Testing Facility
WIND TECHNOLOGY TESTING CENTER

Rahul Yarala, Executive Director, WTTC

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INTRODUCTION

- Wind Industry has requested DOE/NREL for several years to develop better testing infrastructure in US.
- June 2007 NREL selected MA and TX to sign the CRADA to develop large blade testing facility
- May 2009 Secretary Chu announced ARRA award of $25million to construct the large blade testing center

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INTRODUCTION

In May 2011 Governor Patrick announced the start of first blade test (for commissioning the equipment)

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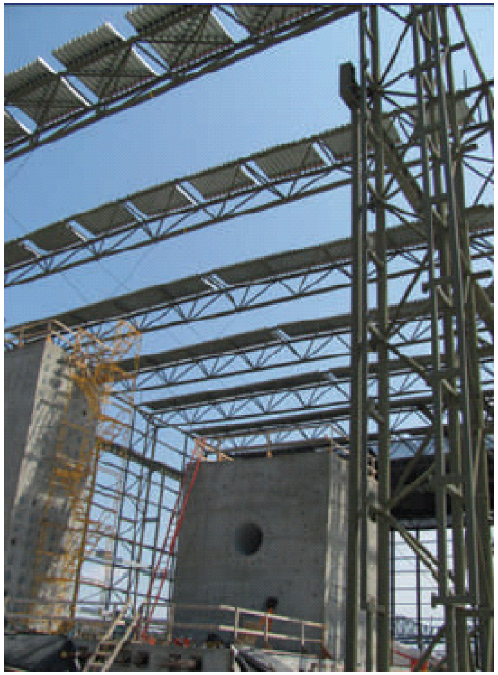
WTTC ranked #6 of 100 Recovery Act Projects Changing America

September 17, 2010 - WASHINGTON DC – Vice President Joe Biden today released a new report, "100 Recovery Act Projects that are Changing America." The report highlights some of the most innovative and effective Recovery Act projects across the country that are not only putting people back to work now, but helping transform our economy for years to come. – Whitehouse.gov

6. Bringing Large Wind-Turbine Testing to America for the First Time – Boston, Massachusetts - $24.7 million

The Massachusetts Clean Energy Center received a $24.7 million award from the Department of Energy to construct a wind blade testing facility. This facility will be the largest of its kind in the world – capable of testing 3 large wind-turbine blades, up to 90 meters in length. The project is expected to be completed by February 2011, and a number of private blade manufacturers have already agreed to send their blades to Boston for testing. Currently, blades of this size are rarely produced in the United States because the cost of testing them overseas is too high. In addition to employing 60 construction workers, this facility could change the wind turbine manufacturing industry in America.



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WTTC Receives Construction Management Association of America 2011 National Project Achievement Award

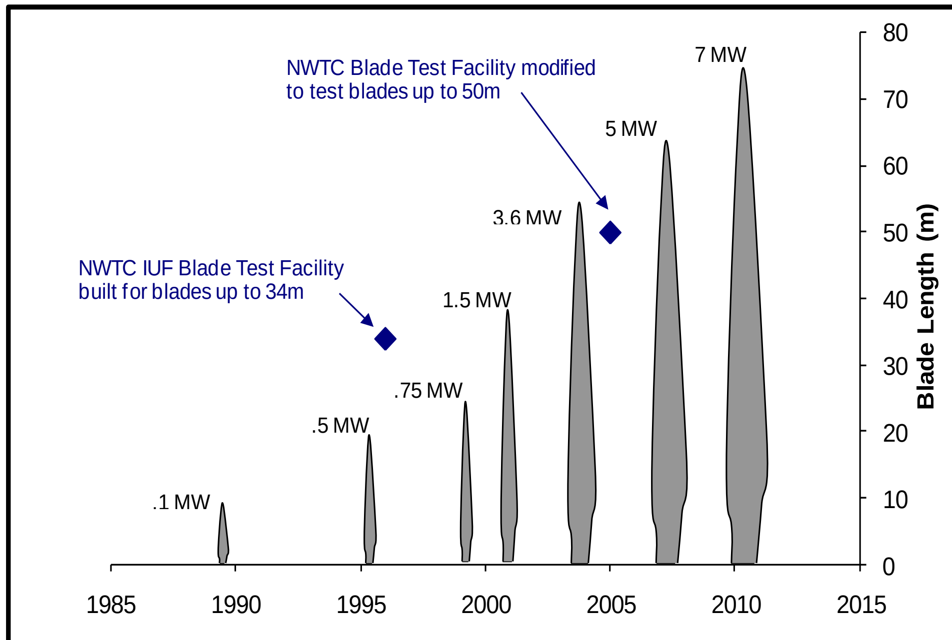
CMAA Advancing Professional Construction and Program Management Worldwide

Since 1999, CMAA has been presenting its Project Achievement Awards to recognize instances in which professional Construction or Program Management has made a significant contribution to the successful completion of a challenging project or program.

Last year's honored projects included the renovation of an historic auditorium, a new supercomputer facility, a seismic upgrade to one of America's largest water systems, a college dormitory expansion and a new NFL football stadium.

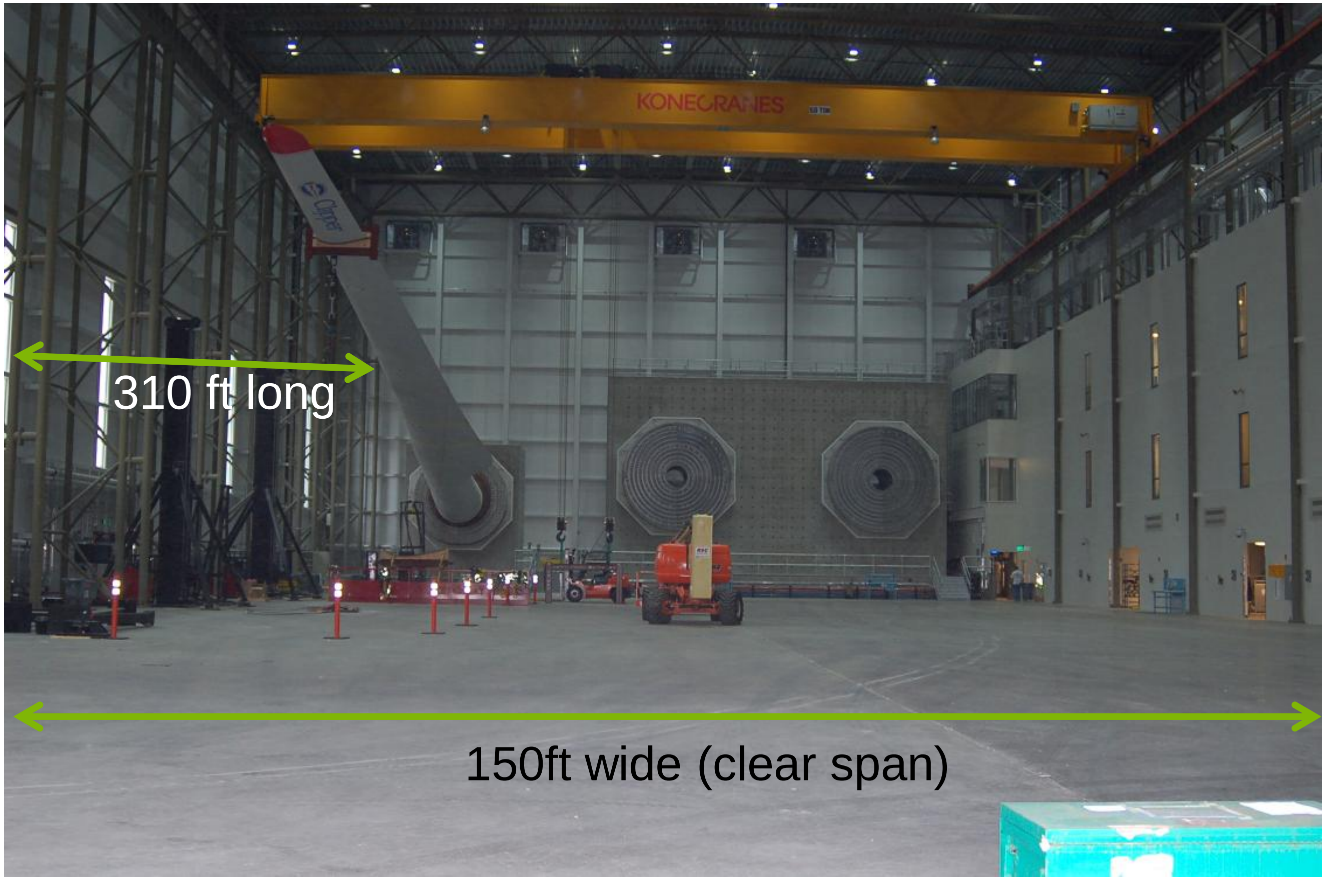
WHY - Statement of the Problem

- Static strength testing and accelerated fatigue testing of wind turbine blades are required for
  - Turbine certification
  - Reduce the risk of widespread failures
  - Improve blade reliability
  - Reduce COE
- Blades over 50m can not be fatigue tested in the United States
- Blades 62m long are in production and longer blades are being designed
- This project will reduce COE by
  - Reducing frequency of blade failures
  - Lowering machine cost
  - Introducing more efficient blades
  - Reducing technical and financial risk of large-scale deployment
  - Providing industry with low cost test facilities to comply with certification requirements and support value engineering



Slide courtesy of Jason Cotrell of NREL

FACILITY INFORMATION



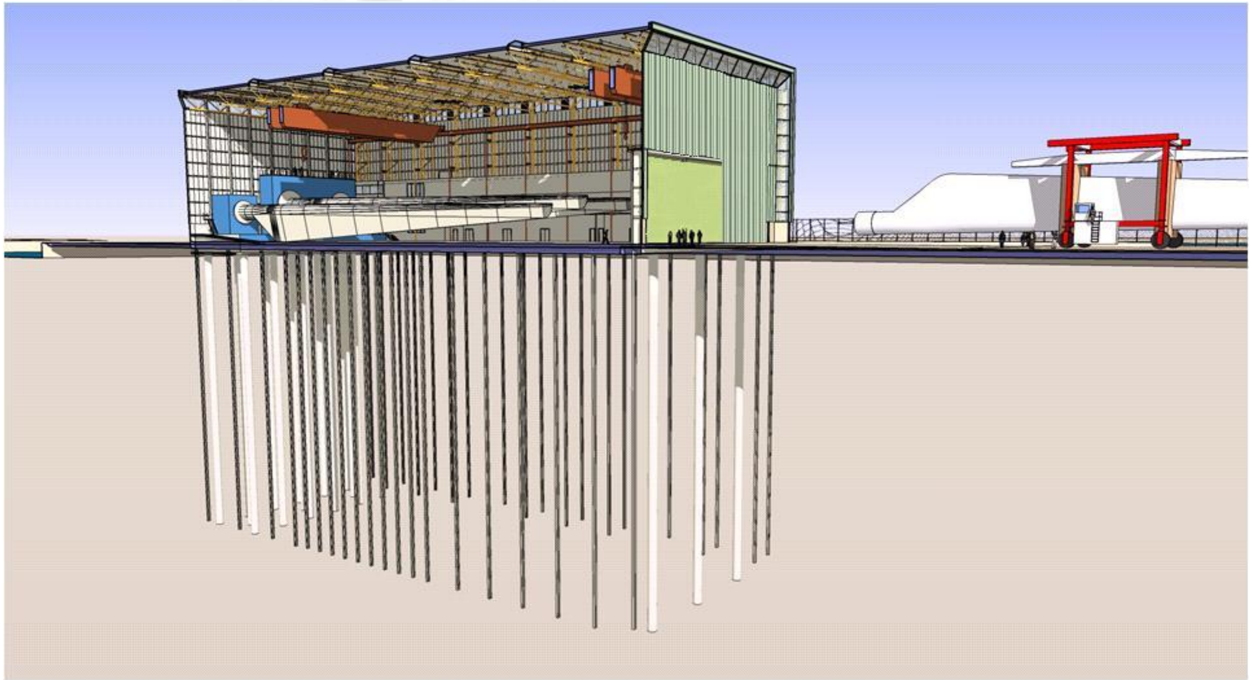
80 ft tall,
72ft clear
height

FACILITY INFORMATION

Specifications*	
Load Capacity	Maximum static bending moment 84-mega Newton meter (MNm)
Blade Length	Up to 90-meter blades depending on test details and specifications
Blade Displacement	32-meter maximum horizontal tip displacement 21-meter maximum vertical tip displacement
Mounting Plates	5-meter diameter with center to center distance of 12 meters
Overhead Cranes	Two independent 50-ton bridge cranes – 100 ton total capacity
Blade Mounting Heights	6.5 meters from floor to blade route center for test stands 1 and 2 5 meters for test stand 3
Static Testing	84-MNm max static root bending moment Test to ultimate failure Up to 8 hydraulic/electrical winches Bending moment tracking Strain distribution Stiffness calibration
Dynamic Testing	NREL's patented resonant test system technology 24-hour fully monitored fatigue testing 21-meter tip-to-tip fatigue test tip displacement

Capabilities*
Full suite of static and fatigue tests per IEC61400-23 standard
Three test stands and 100-ton overhead bridge crane capacity
Blade material testing
Dual axis static or fatigue testing
Lightning protection testing (pending design)
Prototype development and blade repair capabilities
Research and development partnerships
Hands-on workforce training
Strong commitment to client intellectual property protection

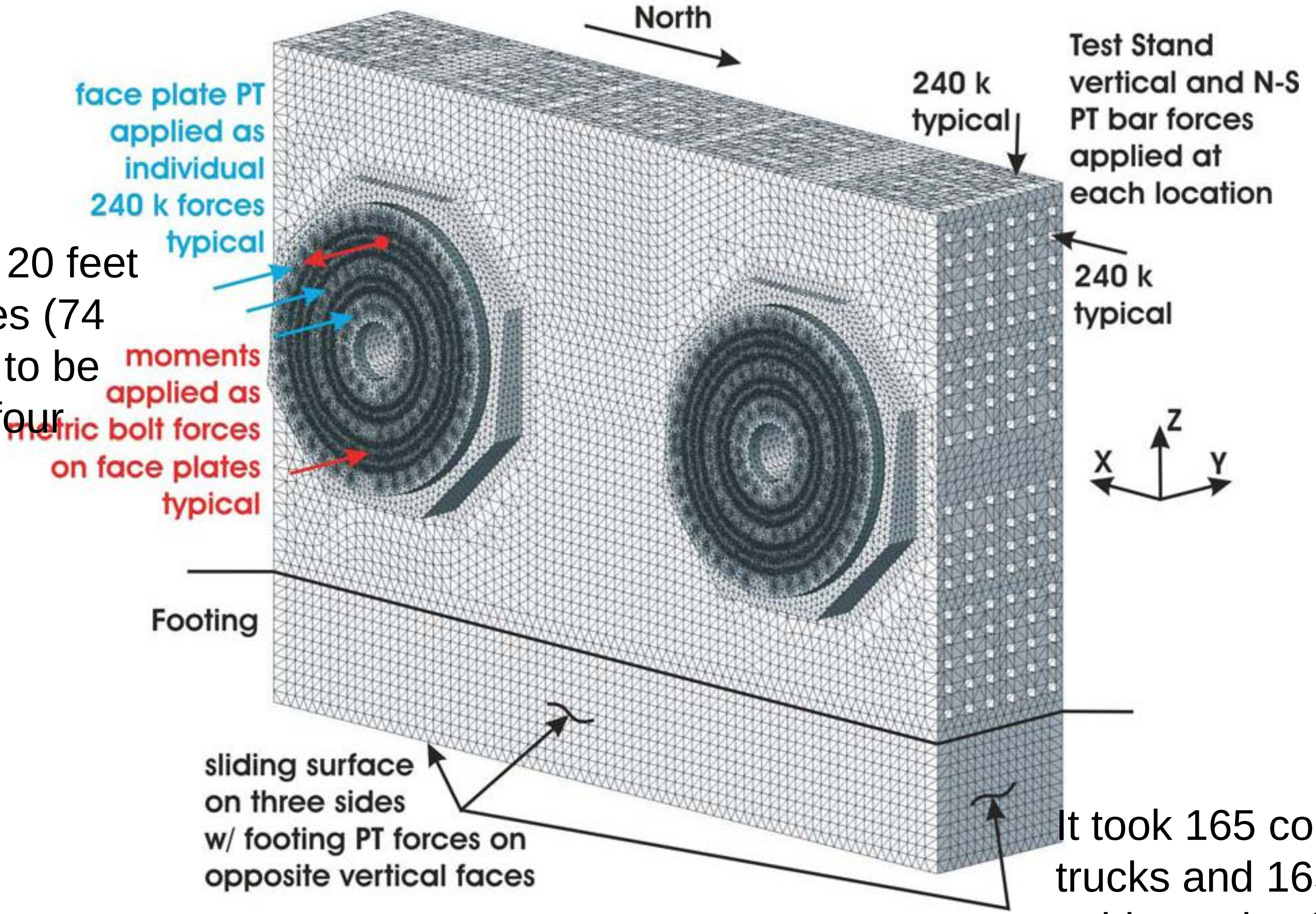
What you will not see - subsurface structure



- There are 18 concrete shafts/caissons and 54 steel piles to provide test load capability and building stability without internal columns.
- On average each caisson was drilled approximately 179 feet down and filled with 110 cubic yards of concrete

Test Stand details

12in thick 20 feet steel plates (74 tons) had to be made in four pieces

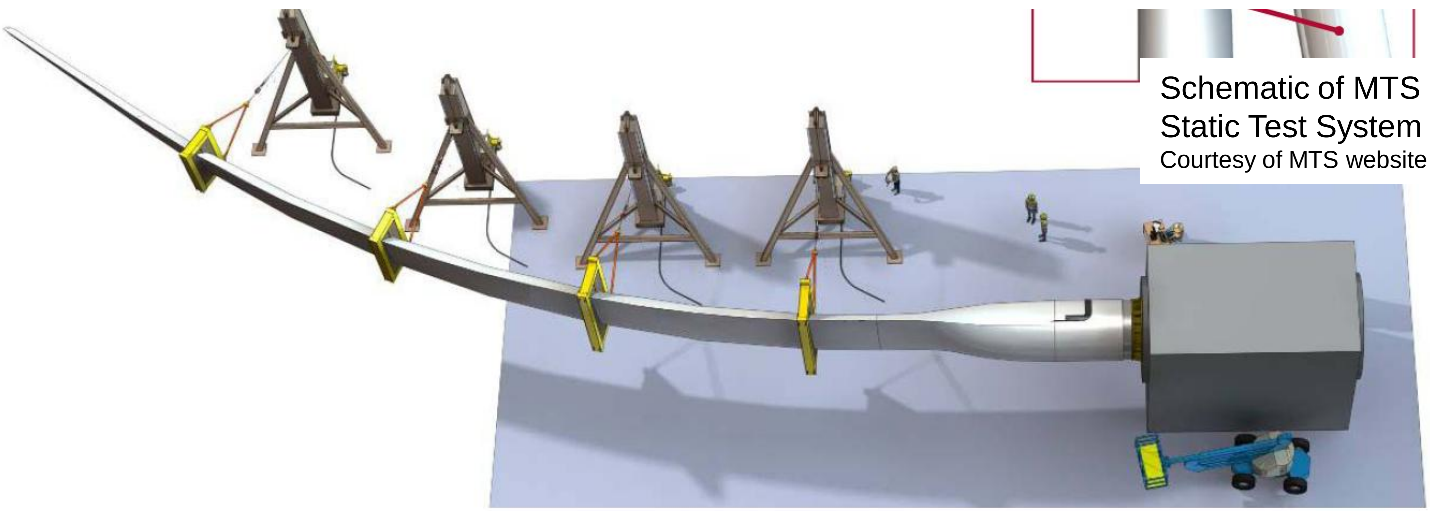


It took 165 concrete trucks and 1650 cubic yards of concrete for the reaction footing

Testing Technology

NREL is lead technical partner developing Static and Fatigue systems

- Procuring a state of the art hydraulic based static test system from MTS
- Working with MTS to scale up NREL UREX Fatigue Test System
- Designing and procuring a new generation of the NREL data acquisition hardware
- Developing a new version of data acquisition software



Schematic of MTS Static Test System
Courtesy of MTS website

Slide courtesy of Jason Cotrell of NREL

Static testing

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Edgewise Fatigue testing

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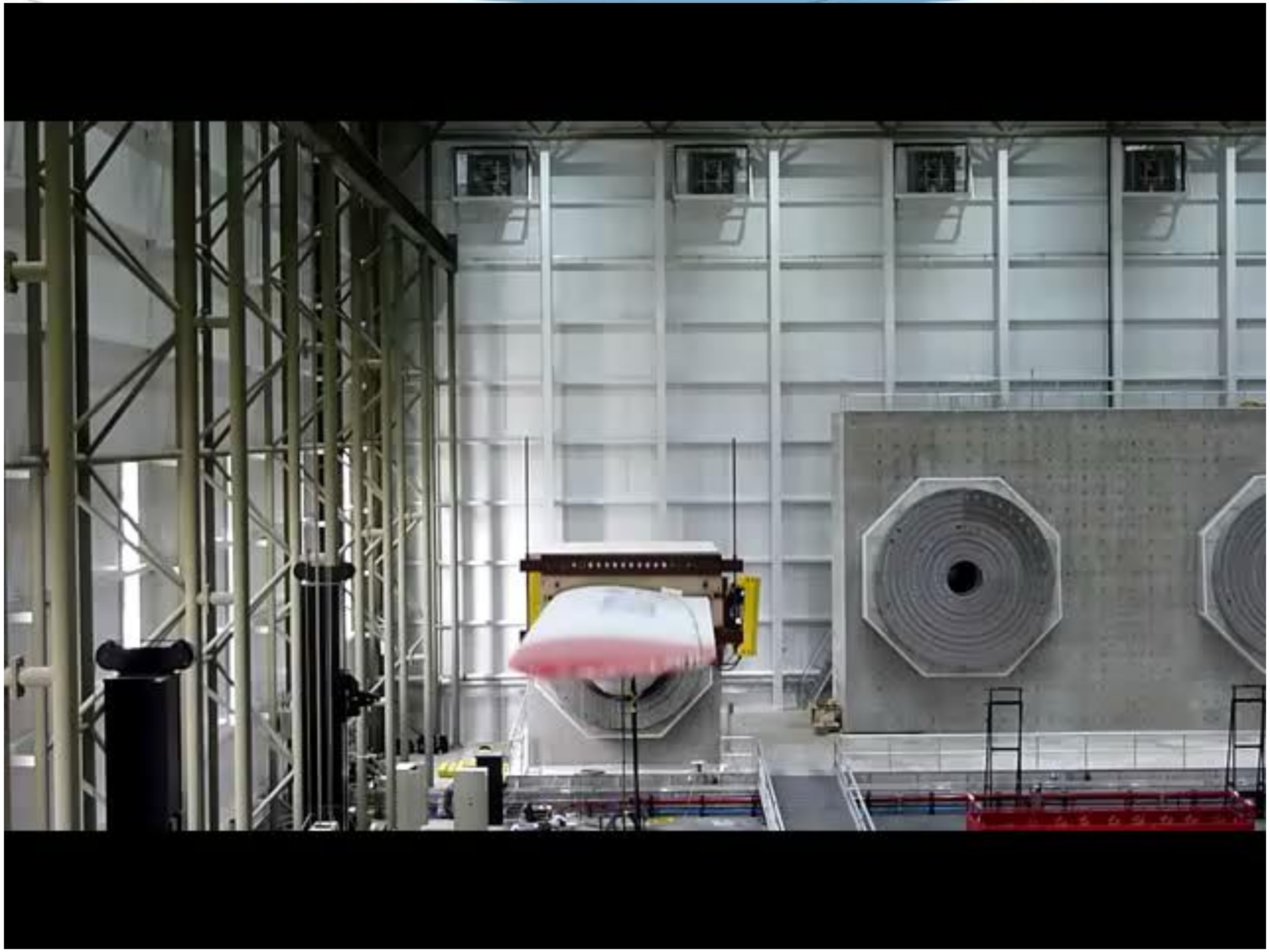
Flap fatigue testing



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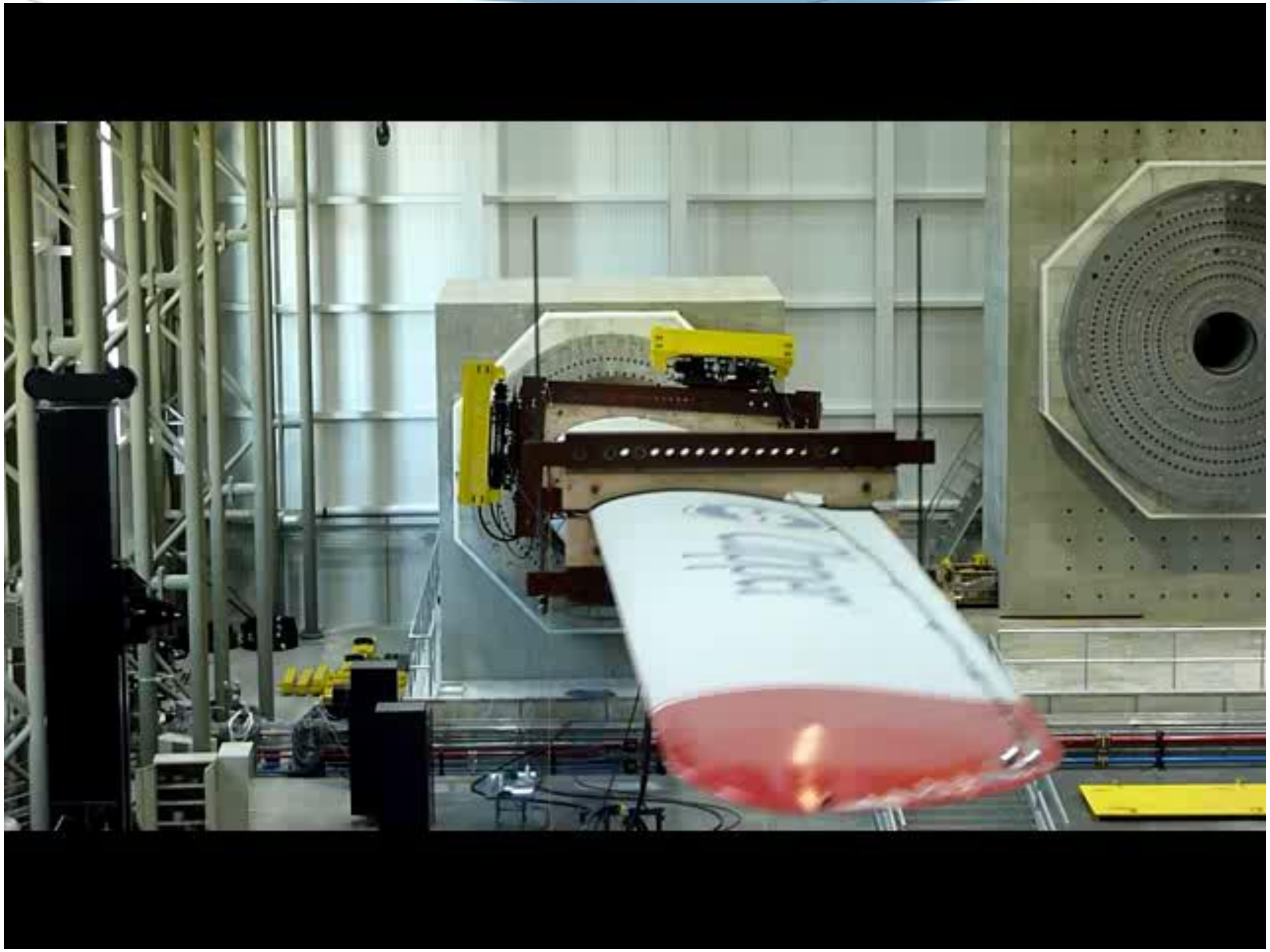
Bi-axial fatigue testing



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OPERATIONS SUMMARY

- Very encouraging response from the wind industry turbine and blade manufacturers
  - Several companies like LM, Gamesa, Clipper, GE, Blade Dynamics, Energetx, Samsung, TPI have had detailed discussions and intend to test blades in the next year or two at the new facility
  - We strive to provide a unique service environment – complete test results in a timely manner and at reasonable prices. In addition to a federally controlled deep water port, close proximity to international airport, we provide fully functional office space to clients, we have special IP protection of data and also large privacy screens in the lab floor for IP protection of physical parts as requested.

- We are also in discussions to partner with several other R&D centers, universities and industry partners to open this unique testing infrastructure and make it a part of short term and long term wind turbine structural components development work.

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