

DOE / SNL Test Facility hosted at TTU

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Jonathan R. White, Ph.D.

Wind Turbine Testing Lead

Wind Energy Technologies Department

jonwhit@sandia.gov

(505) 284-5400



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Outline

- *DOE/SNL Test Facility Critical Needs*
- *DOE/SNL/TTU Partnership*
- *Class-5 Wind Resource Testing Area*
- *ACSA A-27 Turbine Testbed and Capabilities*
- *Repurposed Assembly Building*
- *Summary*



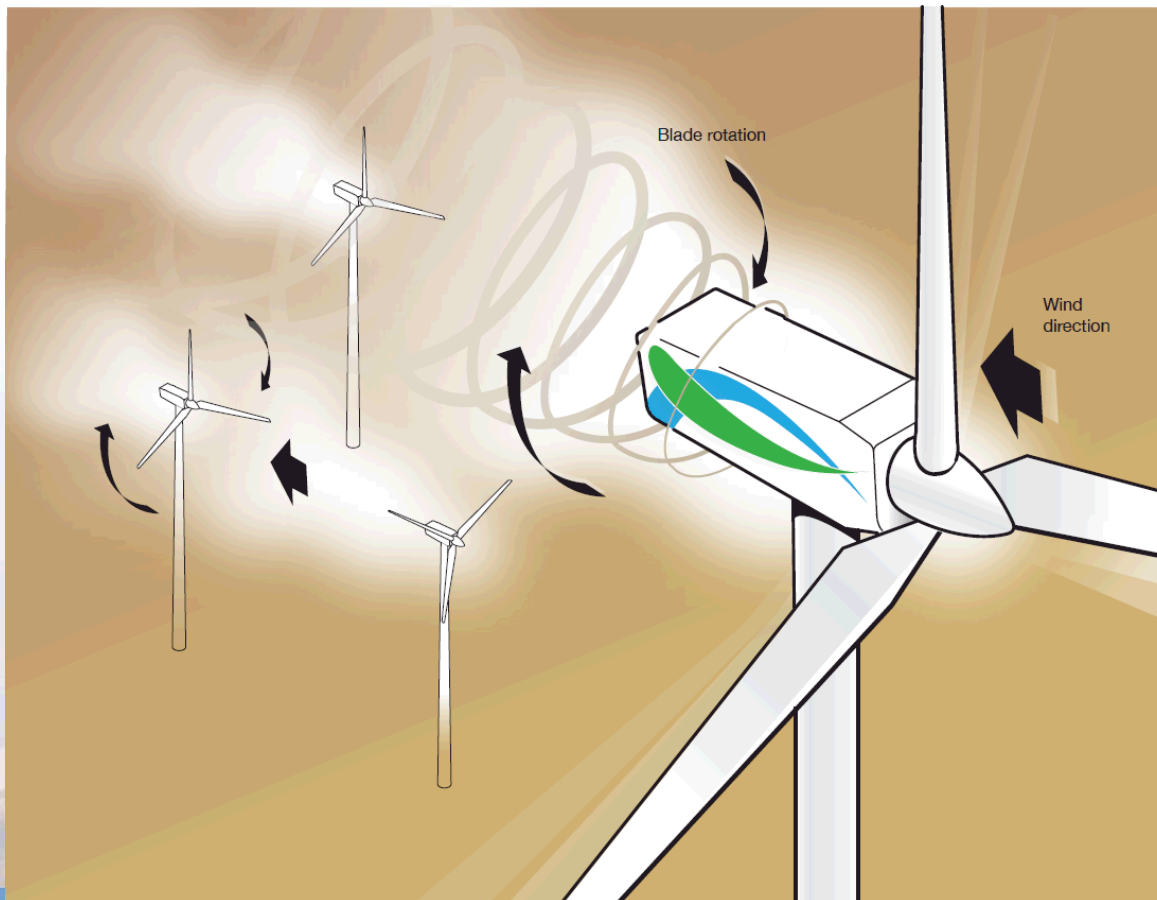
DOE/SNL Test Facility Critical Needs



DOE/SNL Critical Needs I

■ Study of turbine to turbine interaction

- *Wake: power losses, induced loads, merging, meandering*
- *Influence of: inflow turbulence, atmospheric stability, low-level jets*



DOE/SNL Critical Needs II

- ***Rapid cost-efficient advanced wind turbine rotor development***
 - *Passive load control: bend-twist coupling, blade sweep, flatback airfoils*
 - *Active load control: smart rotor, nonlinear wind turbine control, smart turbine design*
 - *Advanced sensing technologies: operational monitoring, structural health monitoring, prognostics*
- ***Aerodynamics, aero-elasticity, and aero-acoustics testbed***
 - *Inboard aerodynamics, 3D blade flow, NUMAD / BPE design tool advancement, near-blade acoustic generation, acoustic propagation, synchronized inflow/aerodynamic/structural/wake measurements*



DOE/SNL/TTU Partnership



DOE/SNL/TTU Partnership

- **Wind Science and Engineering Research Center (WISE) has a 40 year history in wind-related research and development**
- **Unique Capabilities and Facilities**

Distributed Wind Resource Assessment

West Texas Mesonet (60x)

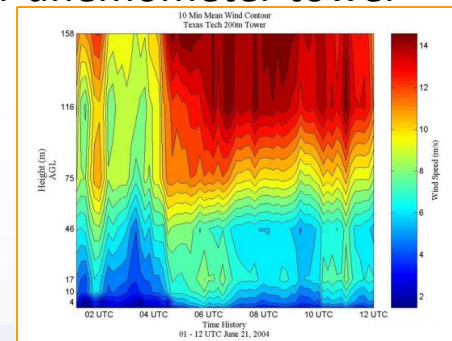


2x mobile Doppler research radars

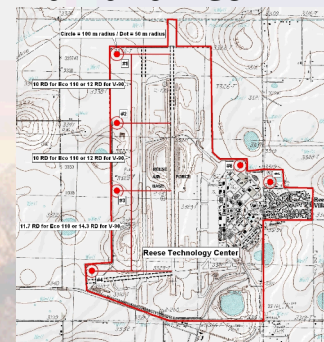


Large-scale Test Infrastructure

200 meter anemometer tower



MW Wind Turbines

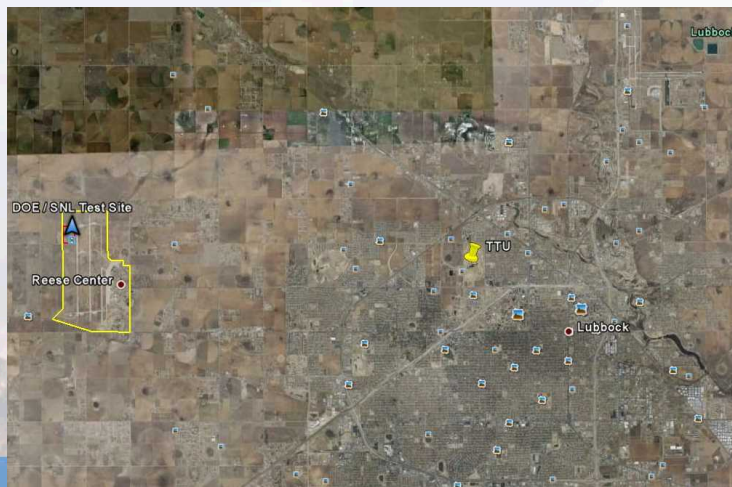
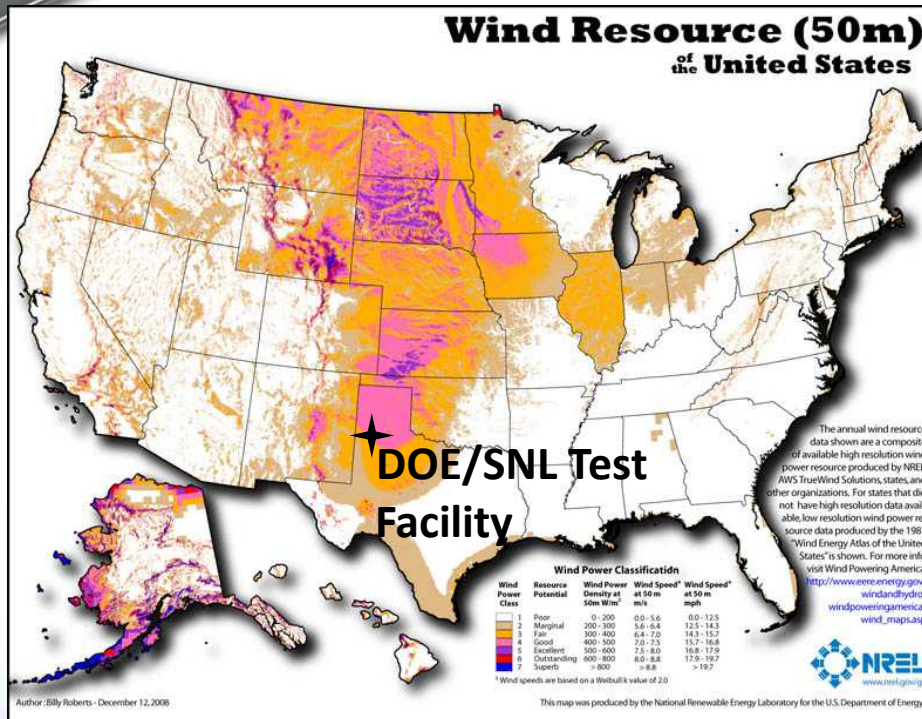




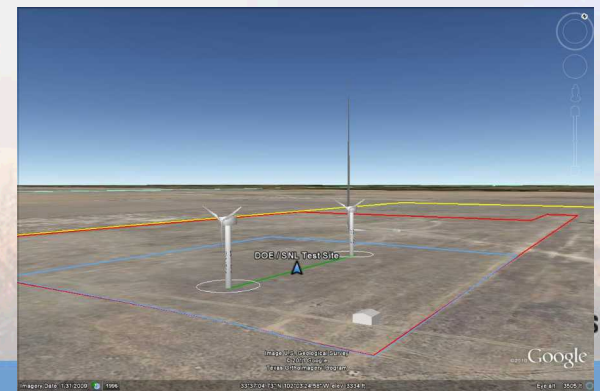
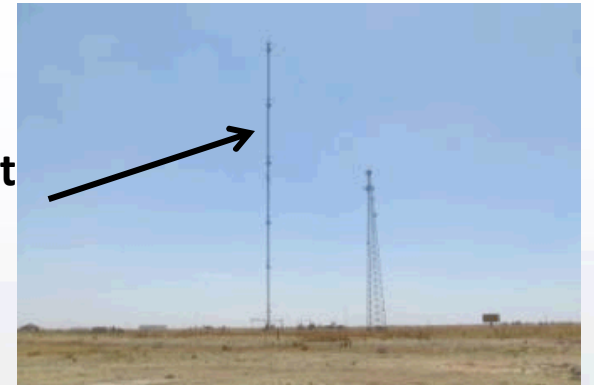
Class-5 Wind Resource Testing Area



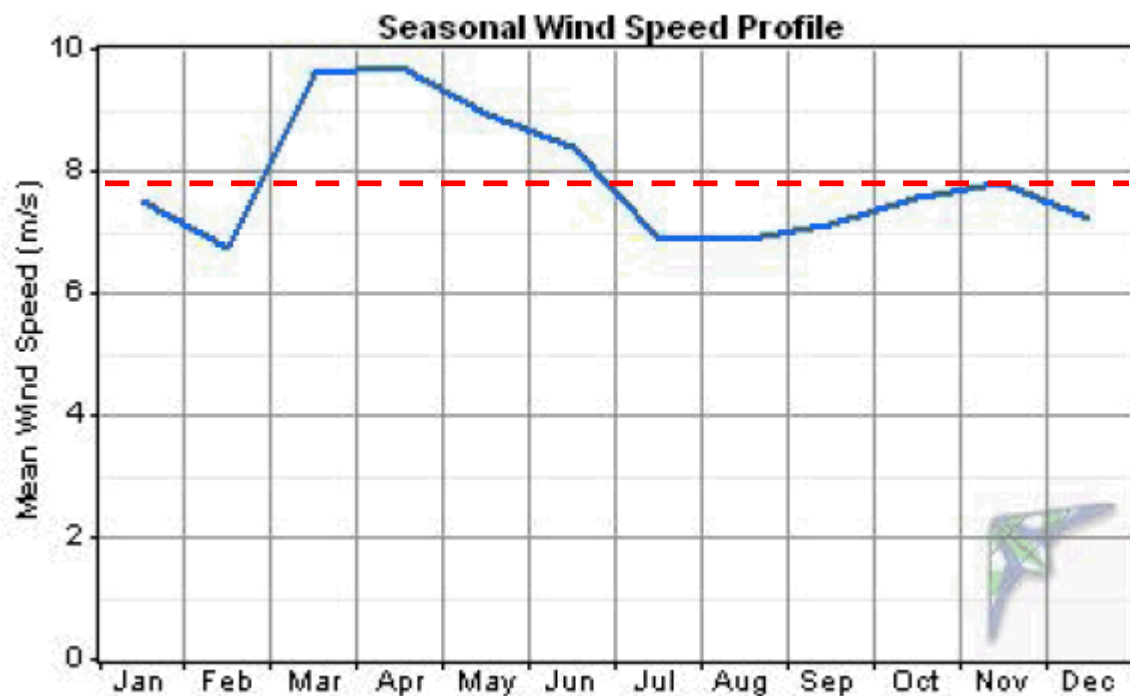
Site Plan



Turbine Site Plan

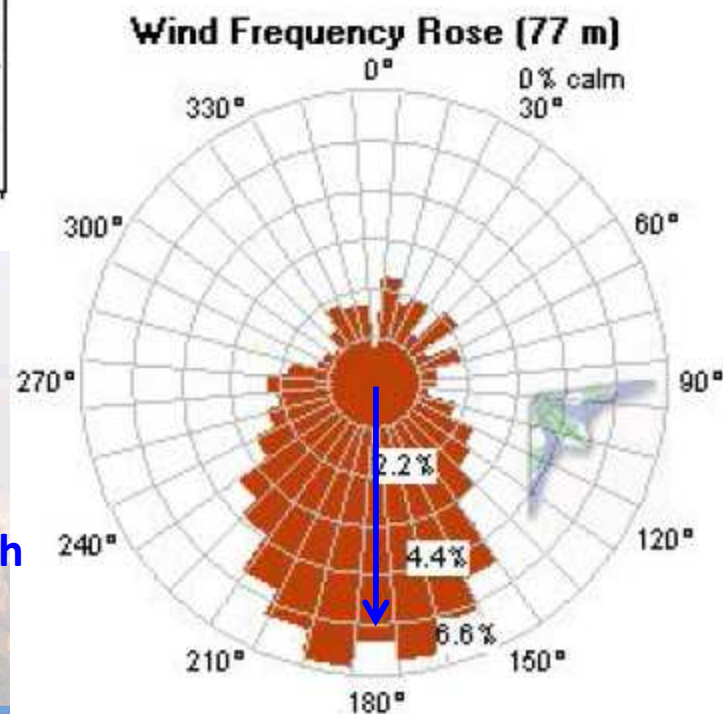


Wind Resource Assessment



8 m/s at 77 m
(7.5 m/s at 50m)

Class 5 Wind Site!



Consistent Wind South
180.5° Average



The background of the slide is a composite image. The top portion shows a close-up of a dark, curved aircraft wing, likely from an A-27, against a bright sky. The bottom portion shows a wide, hazy landscape of rugged, brown mountains under a pale, overcast sky.

ACSA A-27 Turbine Testbed and Capabilities



Test Turbine

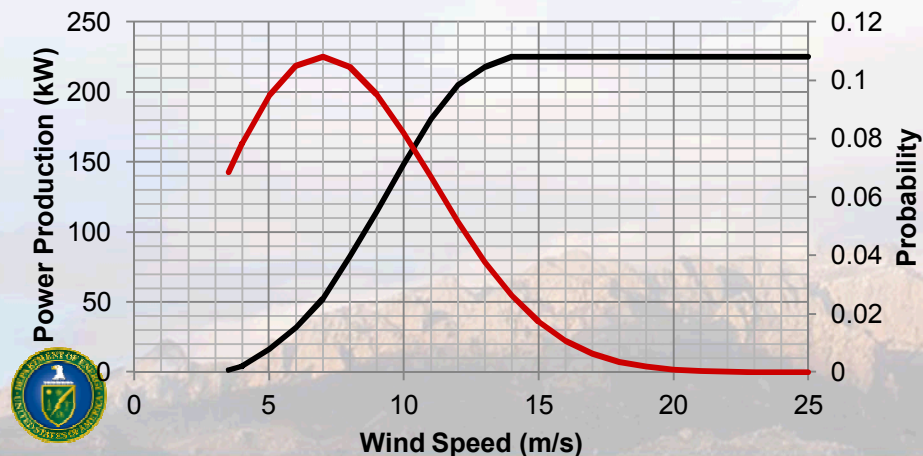
ACSA A-27 (Vestas V-27)

- 225 kW (43 rpm) / 50 kW (33 rpm)
- 13 m (43 ft) Blade Length
- Pitch Control in Region 3
- 30 m (98 ft) Tower Height

Site Production

- 7 m/s hub-ht. average
- 92 kW Average
- 41% Capacity Factor
- 802 MWh

— V-27 — PDF



Turbine Capabilities

■ Instrumentation

- *Full aerodynamic and atmospheric inflow characterization (200m)*
- *High-density rotor aerodynamic and structural measurement*
- *Drivetrain position, speed, torque, thrust, and bending*
- *Tower bending and inertial monitoring*
- *Power magnitude, phase, and quality*

■ Model

- *Complete schematics and construction diagrams*
- *Validation experimental results for components and system*



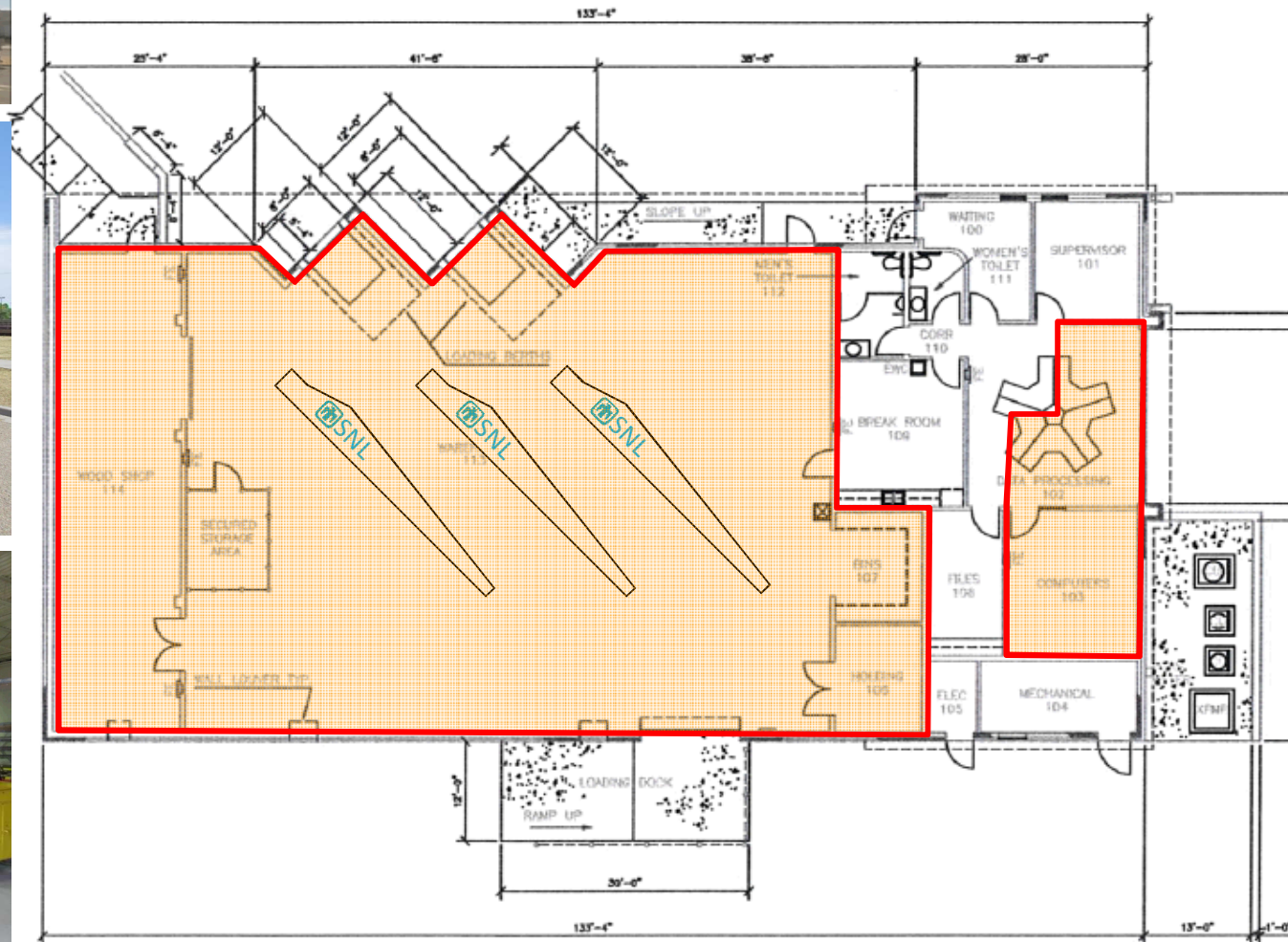
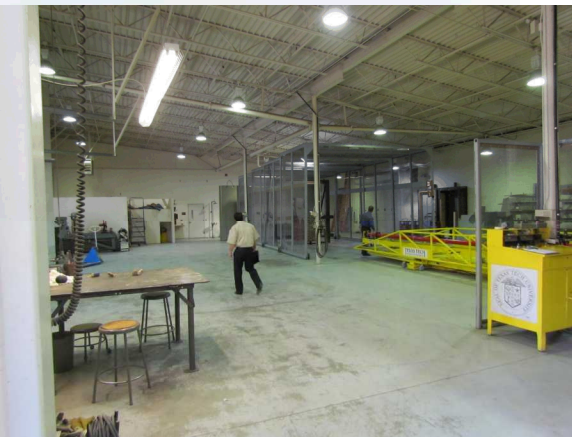


Repurposed Assembly Building



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Repurposed Assembly Building



Summary

- *Test facility for turbine-turbine and advanced rotor development*
- *TTU partnership adds to the facilities and technical depth of the research and development*
- *Class-5 wind resource for rapid wind energy testing*
- *A-27 wind turbine test bed for next-generation of inflow/aerodynamic/structural/wake testing*
- *Operational in FY12*

