

# DOE / SNL Test Facility hosted at TTU

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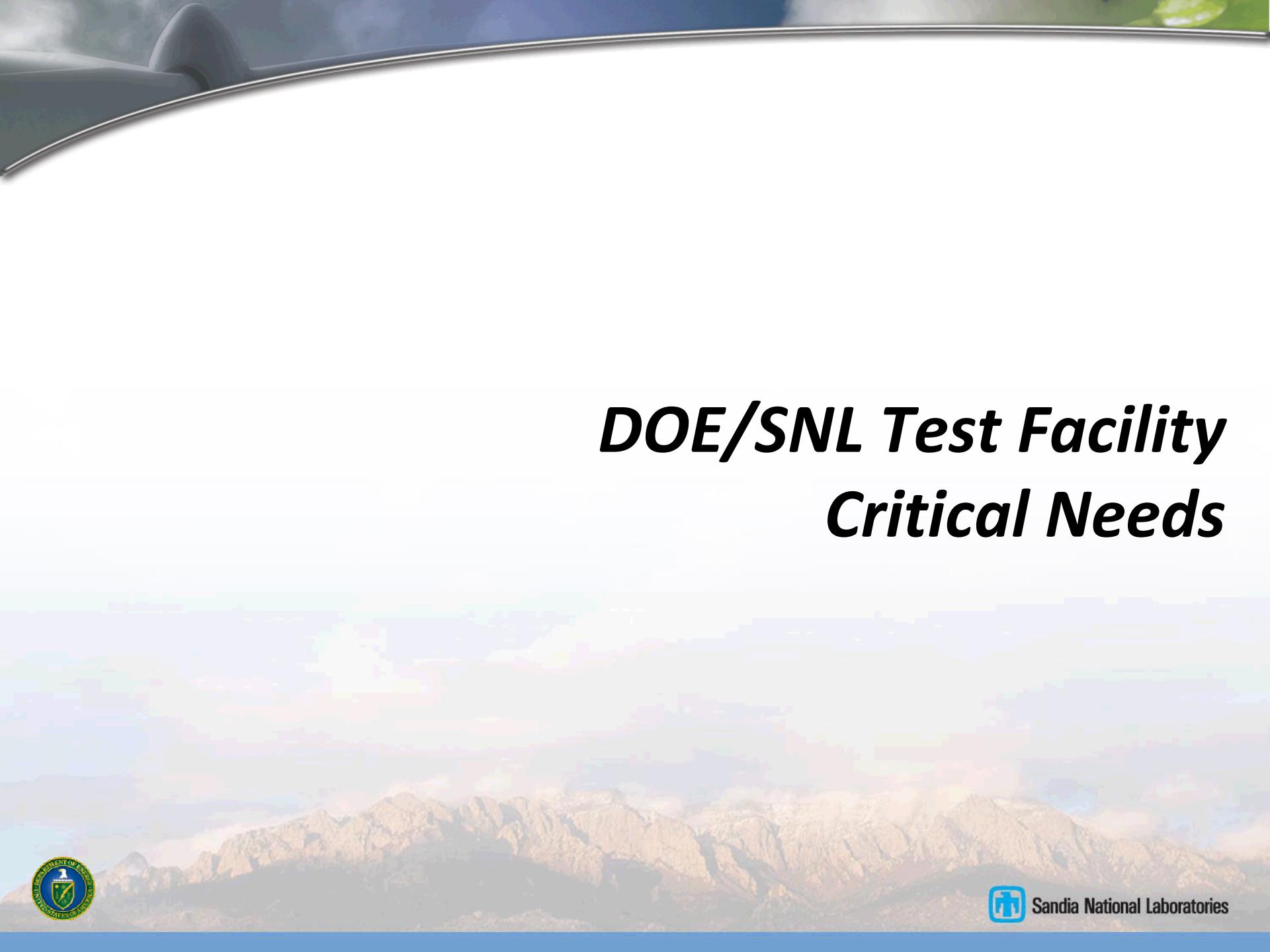
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# Outline

- *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*



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# ***DOE/SNL Test Facility Critical Needs***

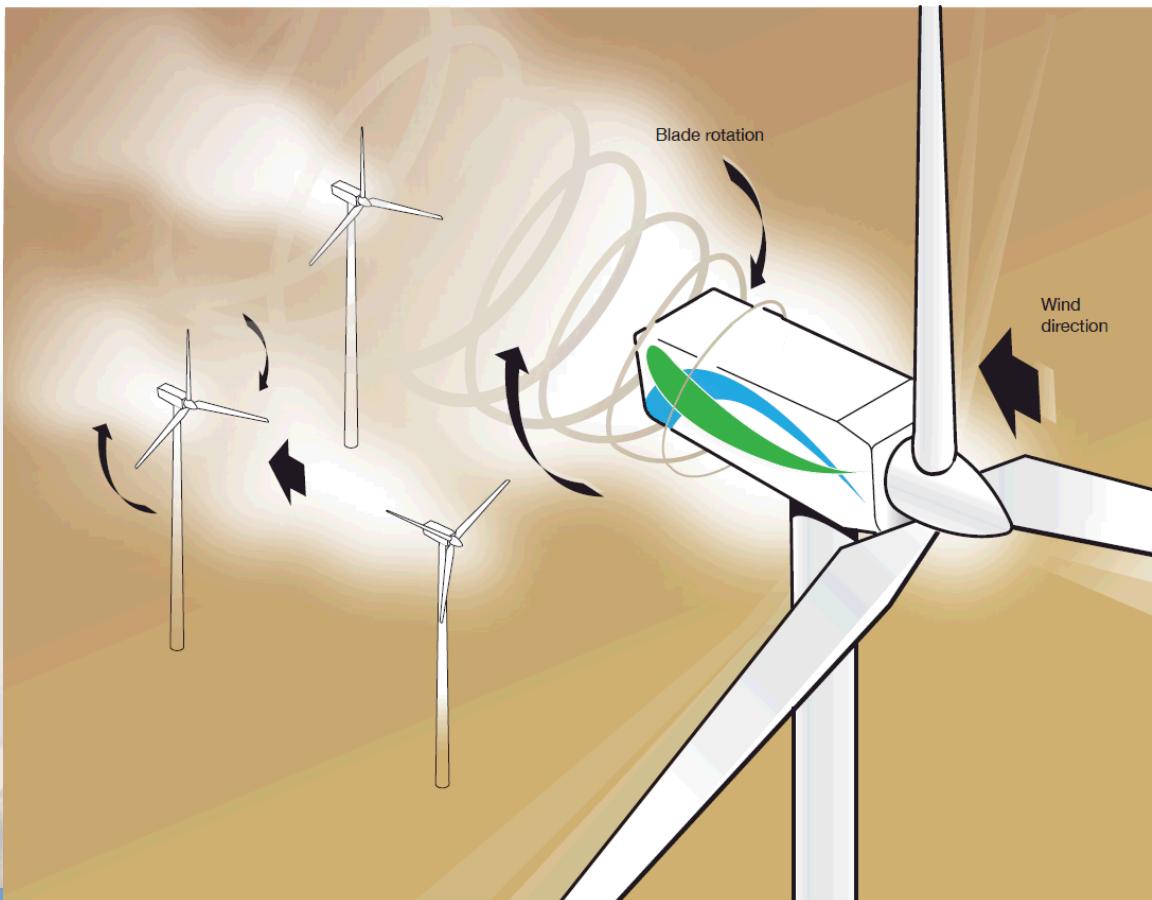


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# DOE/SNL Critical Needs I

## ■ Study of turbine to turbine interaction

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



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# 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*



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# ***DOE/SNL/TTU Partnership***



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# 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)*

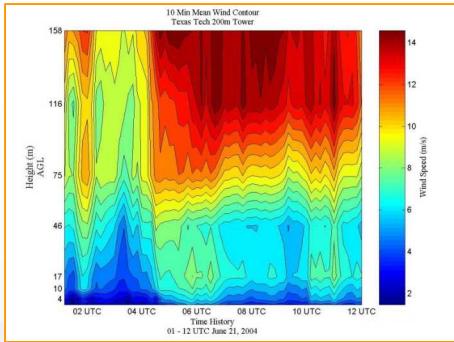


*2x mobile Doppler research radars*

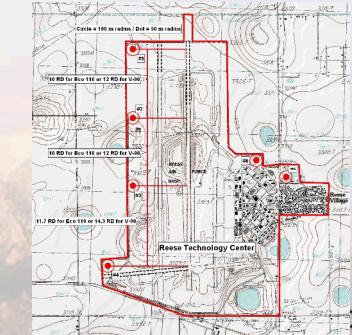


## Large-scale Test Infrastructure

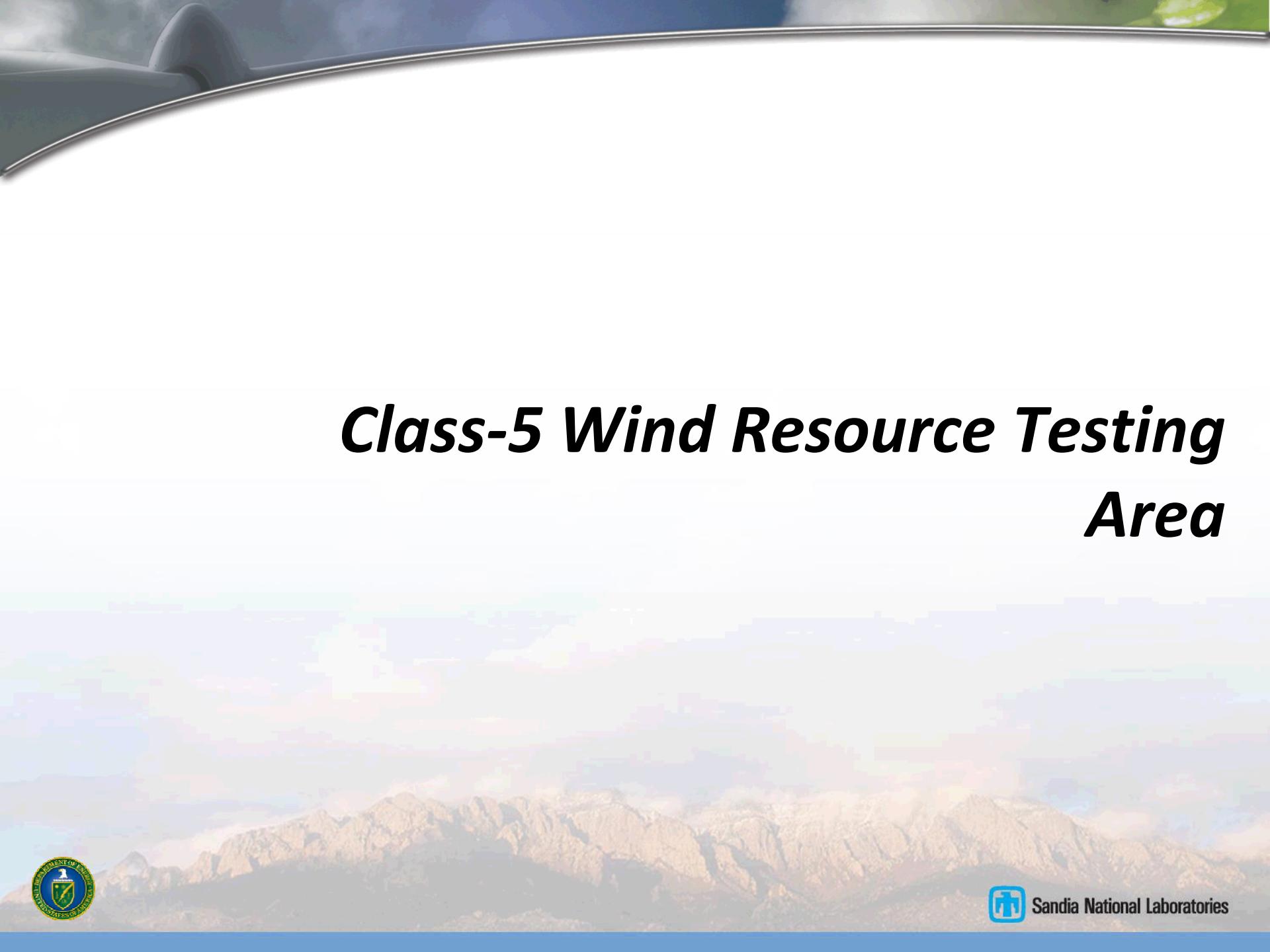
*200 meter anemometer tower*



*MW Wind Turbines*



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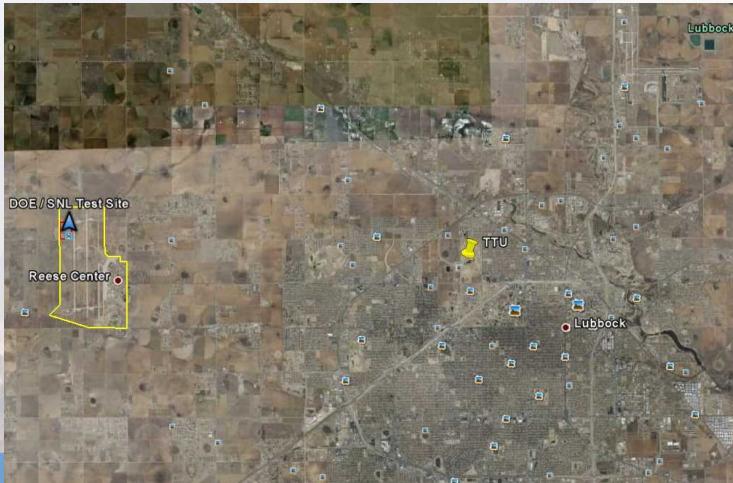
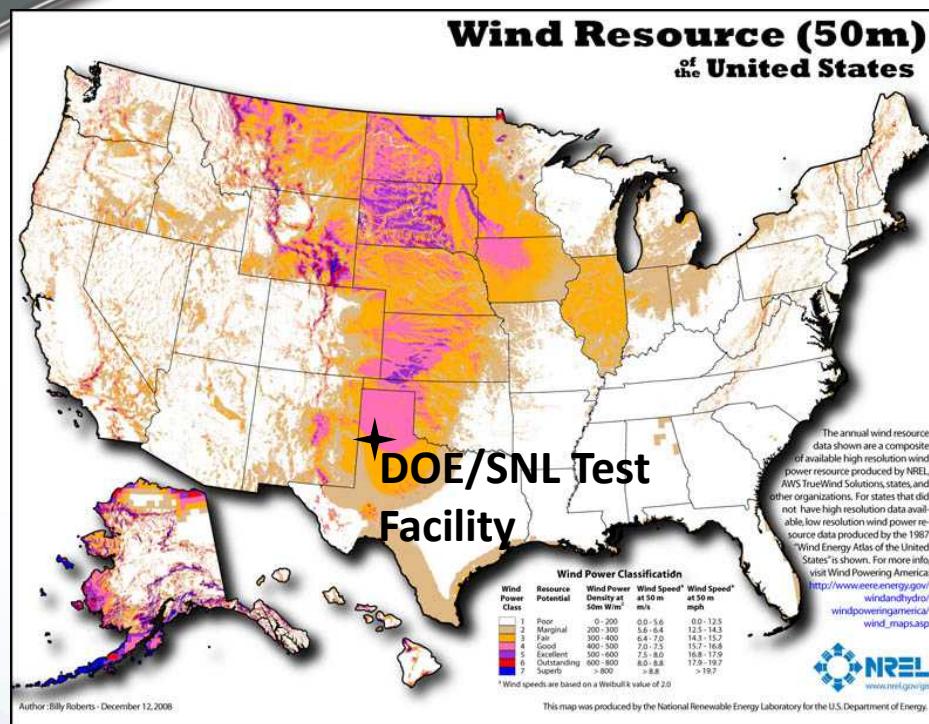


# *Class-5 Wind Resource Testing Area*

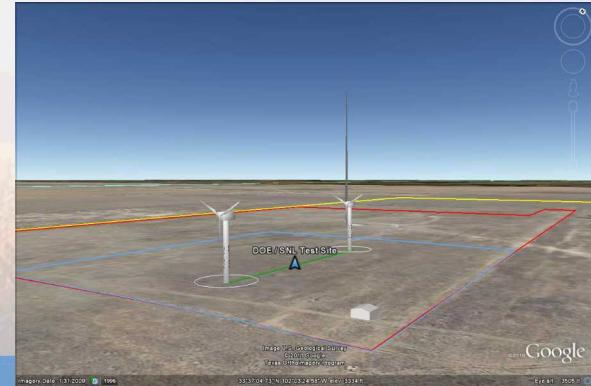
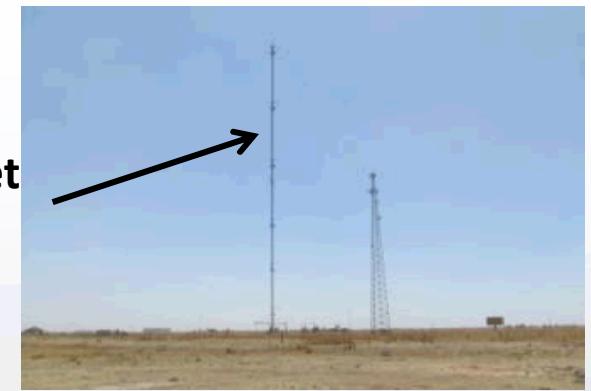


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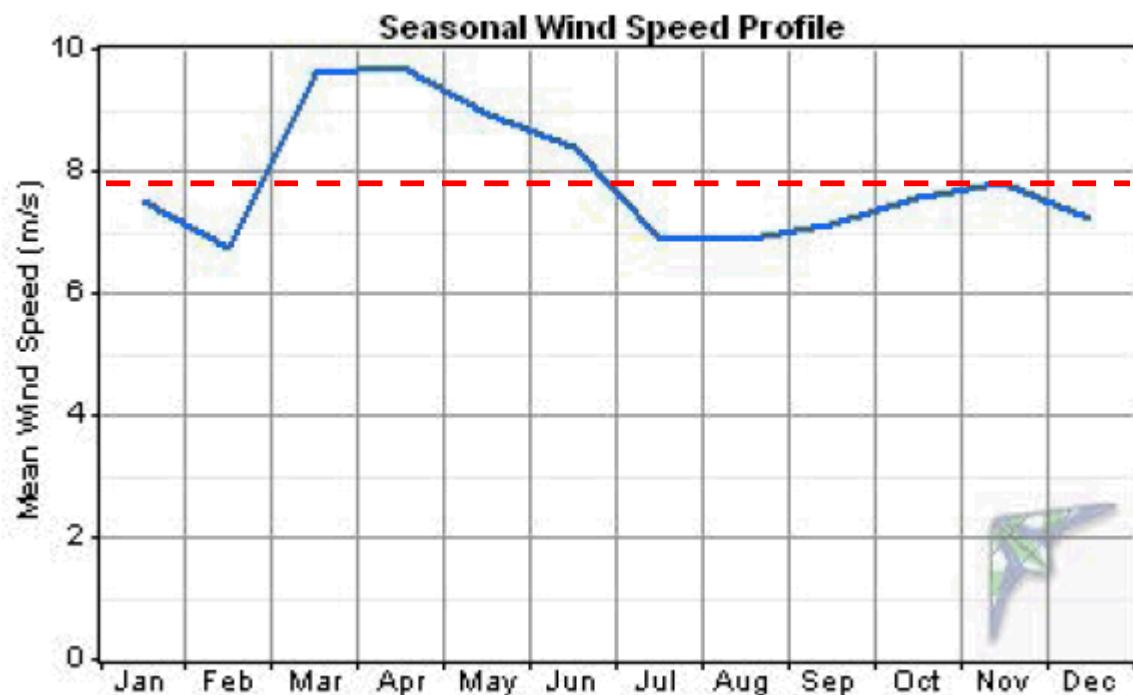
# Site Plan



# Turbine Site Plan

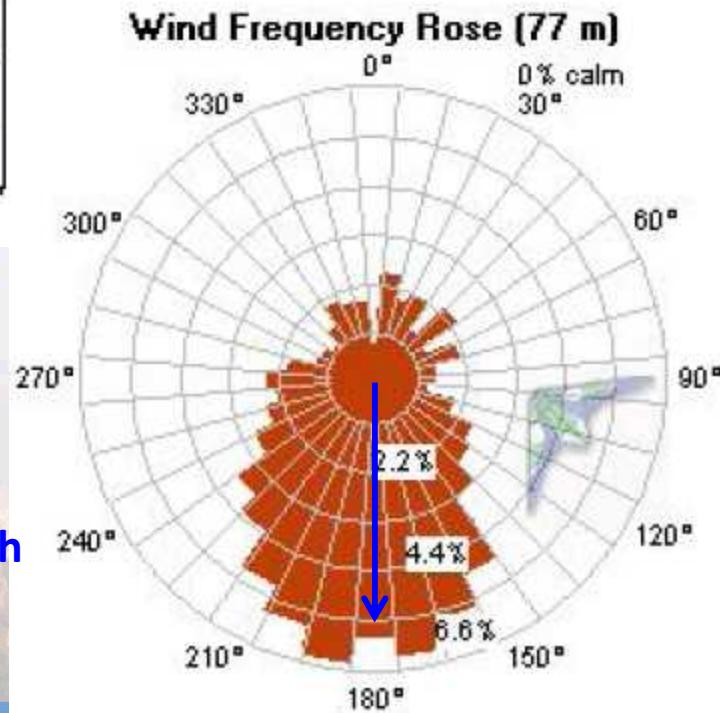


# Wind Resource Assessment



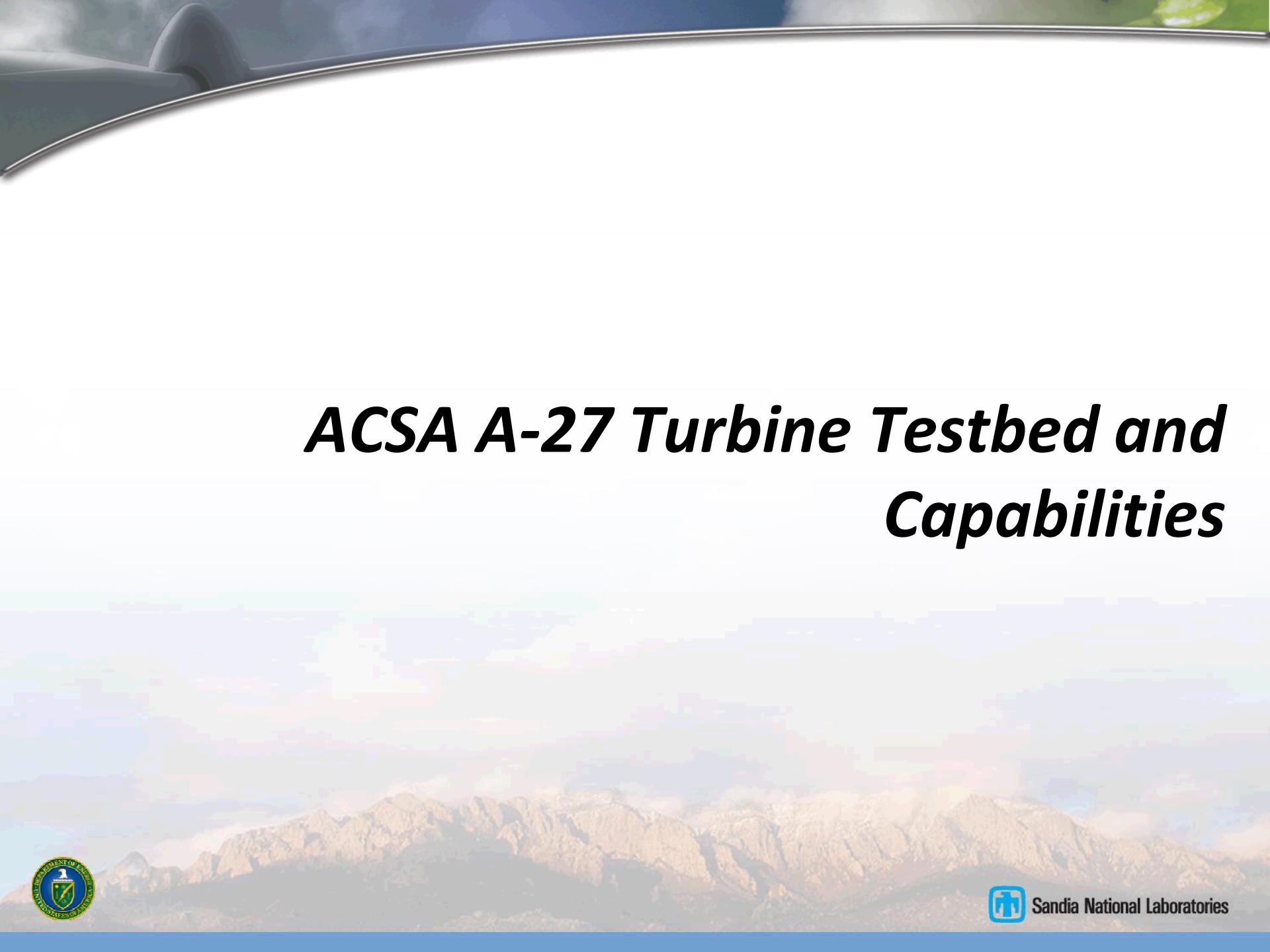
8 m/s at 77 m  
(7.5 m/s at 50m)

Class 5 Wind Site!



Consistent Wind South  
180.5° Average



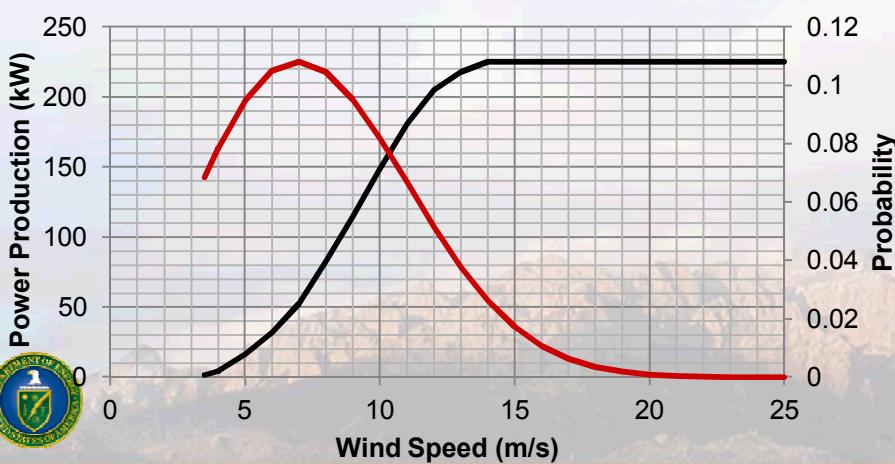


# *ACSA A-27 Turbine Testbed and Capabilities*



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# *Test Turbine*



## Site Production

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



# 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*



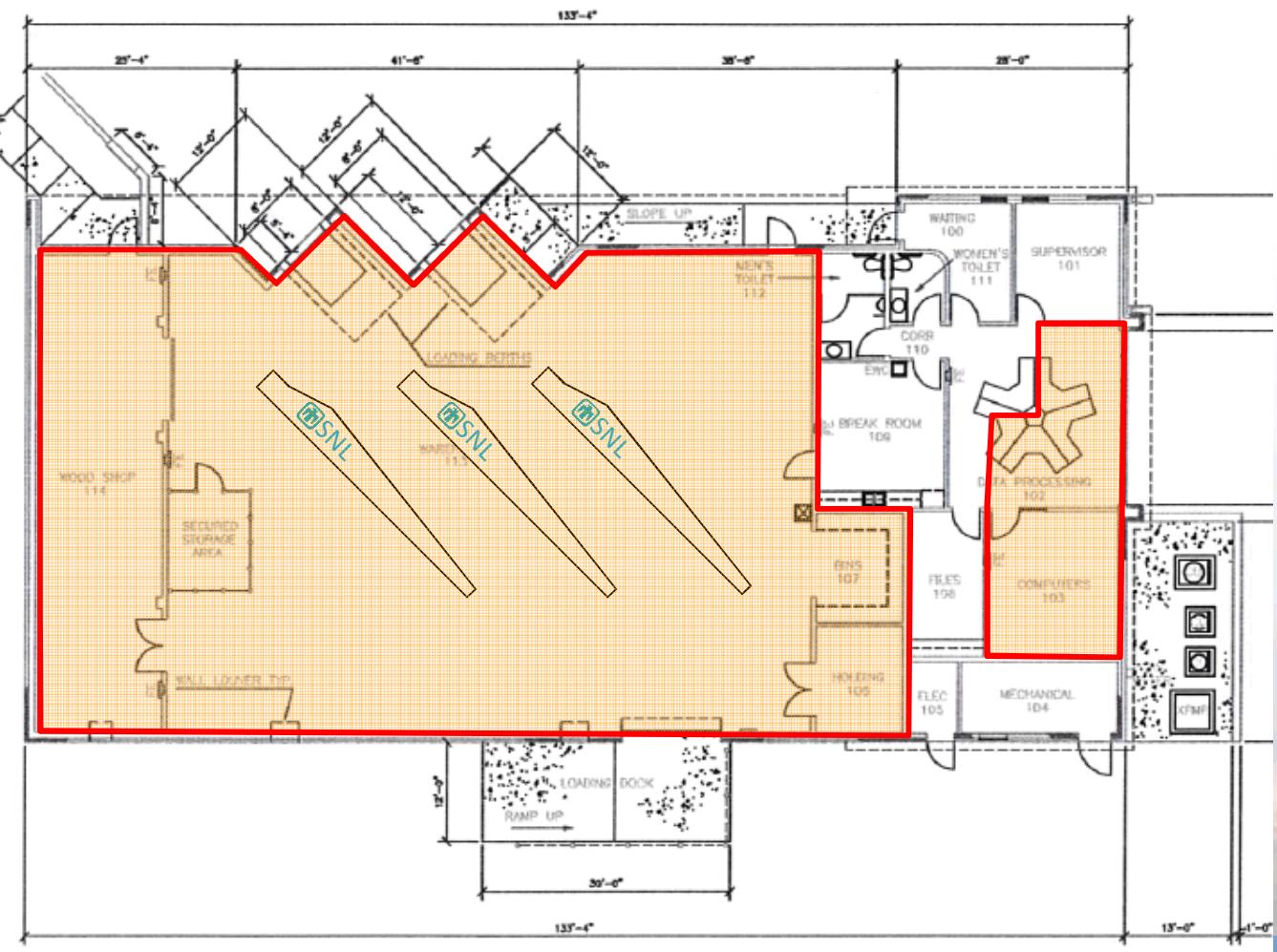
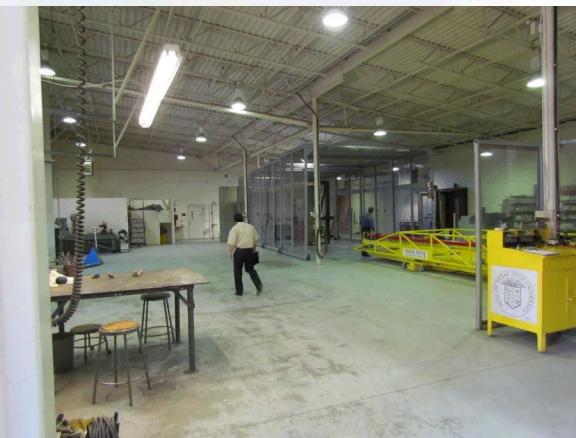
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# *Repurposed Assembly Building*



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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*



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