

# Wind Energy Manufacturing and Supply Chain Development Proposal

**Jose R. Zayas**

Program Manager, Wind Energy Technology  
Sandia National Laboratories

&

**Bob Thresher**

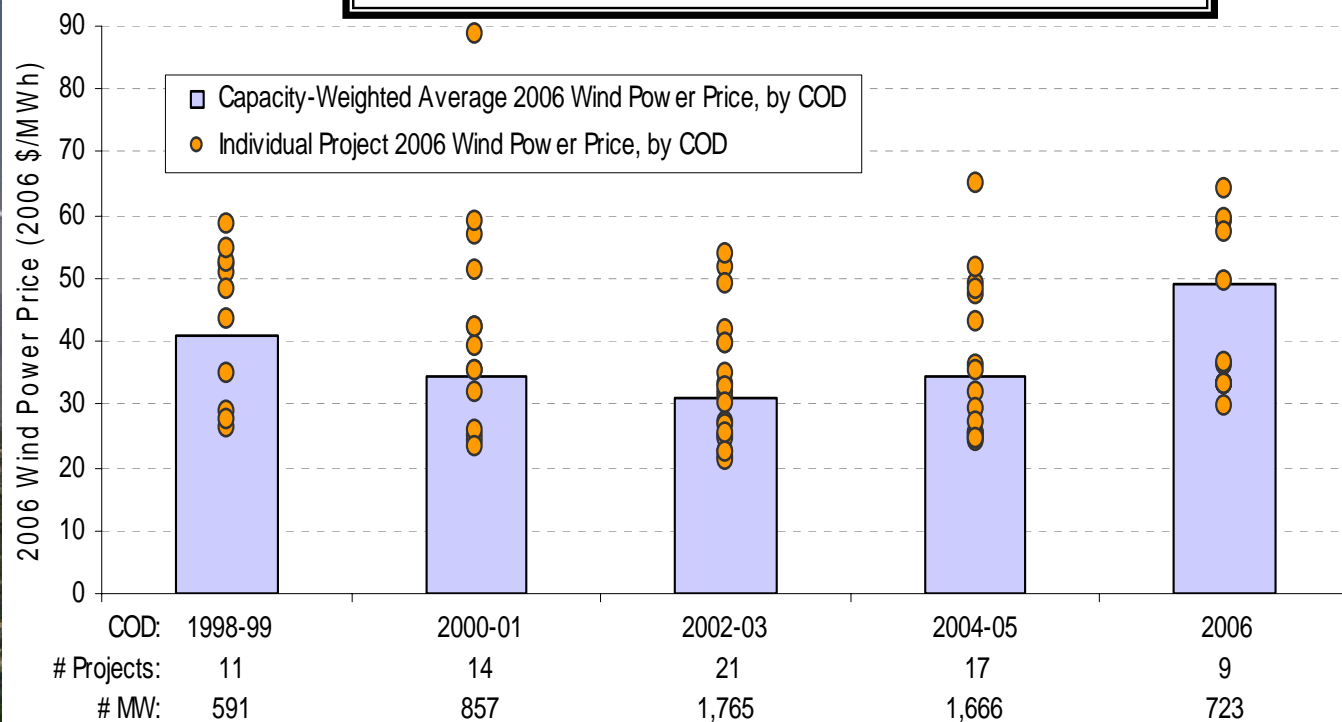
Director, NWTC  
National Renewable Energy Laboratory

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# Wind Industry Trends & Challenges

## Costs (in 2002)

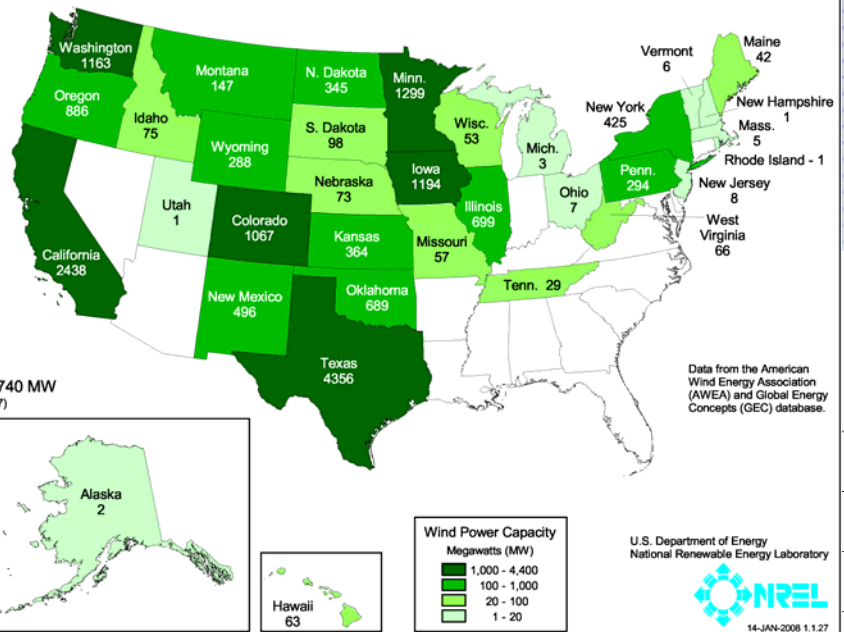
- System < \$3/lb
  - Blades < \$5/lb
  - ~ \$1.00/Watt \*
  - \$0.04-0.06/kWh \*
- Recent cost of steel & copper increases have increased cost by 30 -50%
  - Currency exchange rate
  - Limited Manufacturers & Suppliers



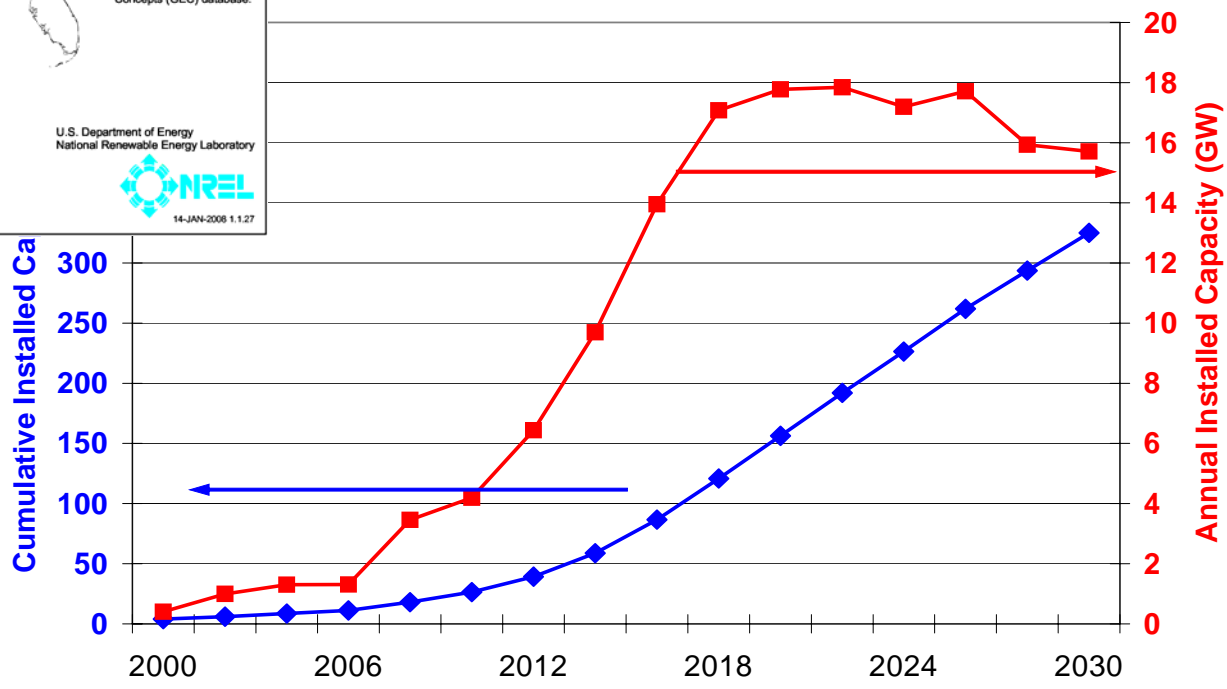
Source: Berkeley Lab database

# A Wind Energy Future

United States - 2007 Year End Wind Power Capacity (MW)



## Scenario: 20% in 2030 (320GW)



Now, 16,842MW as of  
Dec 31, 2007

# *Proposal Rationale*

## ■ **Goal:**

- Rapidly and dramatically expand the U.S. wind turbine component supply base to support industry growth and enable the 20% Wind Energy Scenario

## ■ **Opportunity:**

- Supports the current rapid growth in U.S. wind energy installations
- Enables the 20% Wind Scenarios by expanding the supply chain
- Increases component supply while increasing reliability and reducing cost
- Enhances the economic benefits to the U.S. economy by creating domestic suppliers and jobs

## ■ **Challenges:**

- Existing U.S. manufacturer and supplier base has little wind engineering, or manufacturing experience
- Domestic labor rates versus overseas rates will require advanced processes and automation to compete
- New component suppliers must economically compete and certify their products against the existing entrenched low cost component suppliers

# *Potential Scope for Manufacturing and Supply Chain Development*

- **Partnerships for advanced R&D to enhanced reliability and reduce manufacturing costs for component suppliers:**
  - Rotors, Blades, and Pitch Systems
  - Drivetrains, Gearboxes, and Generators
  - Towers, Installation, and Transport Systems
- **Partnerships for supply chain expansion for efficient and competitive U.S. wind turbine markets:**
  - Design review and technical analysis for new equipment supplier products to meet turbine manufacturer specifications
  - A2LA accredited laboratory and field testing for suppliers to develop and certify new components

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# Example: Sandia Blade Materials R&D

## Goal:

- Engineer composites materials that can be manufactured to reduce the weight and increase the strength of wind turbine blades

## Current Status:

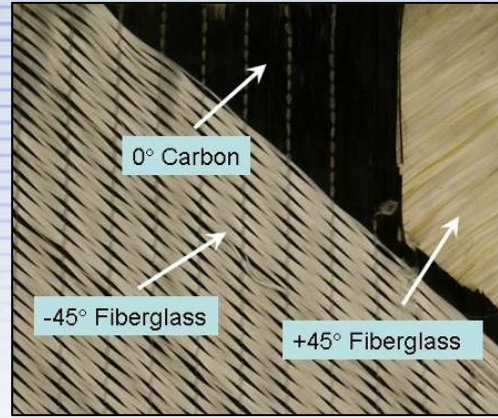
- Materials
  - Investigating new configurations of carbon fibers
  - Characterization of materials
- Design
  - Structurally efficient designs
  - Composite hybrid designs

## Industry Impact:

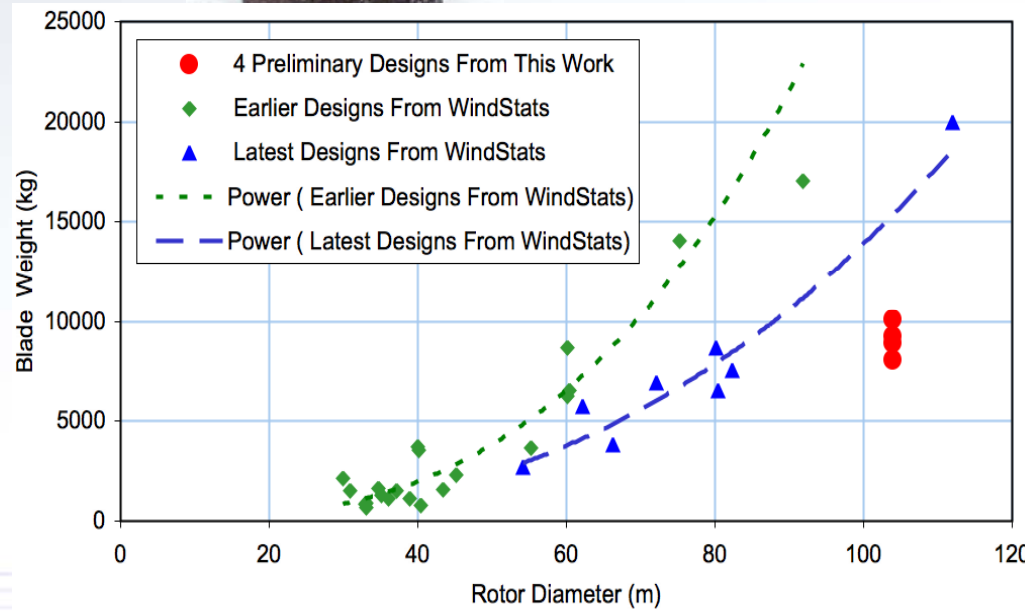
- Weight reductions
- Enable novel concepts

## Large Materials Database

- Material properties (10000+ tests for 175 materials)
- Database updated once per year



**SAERTEX  
Glass/Carbon Triax**



# Economics Benefits

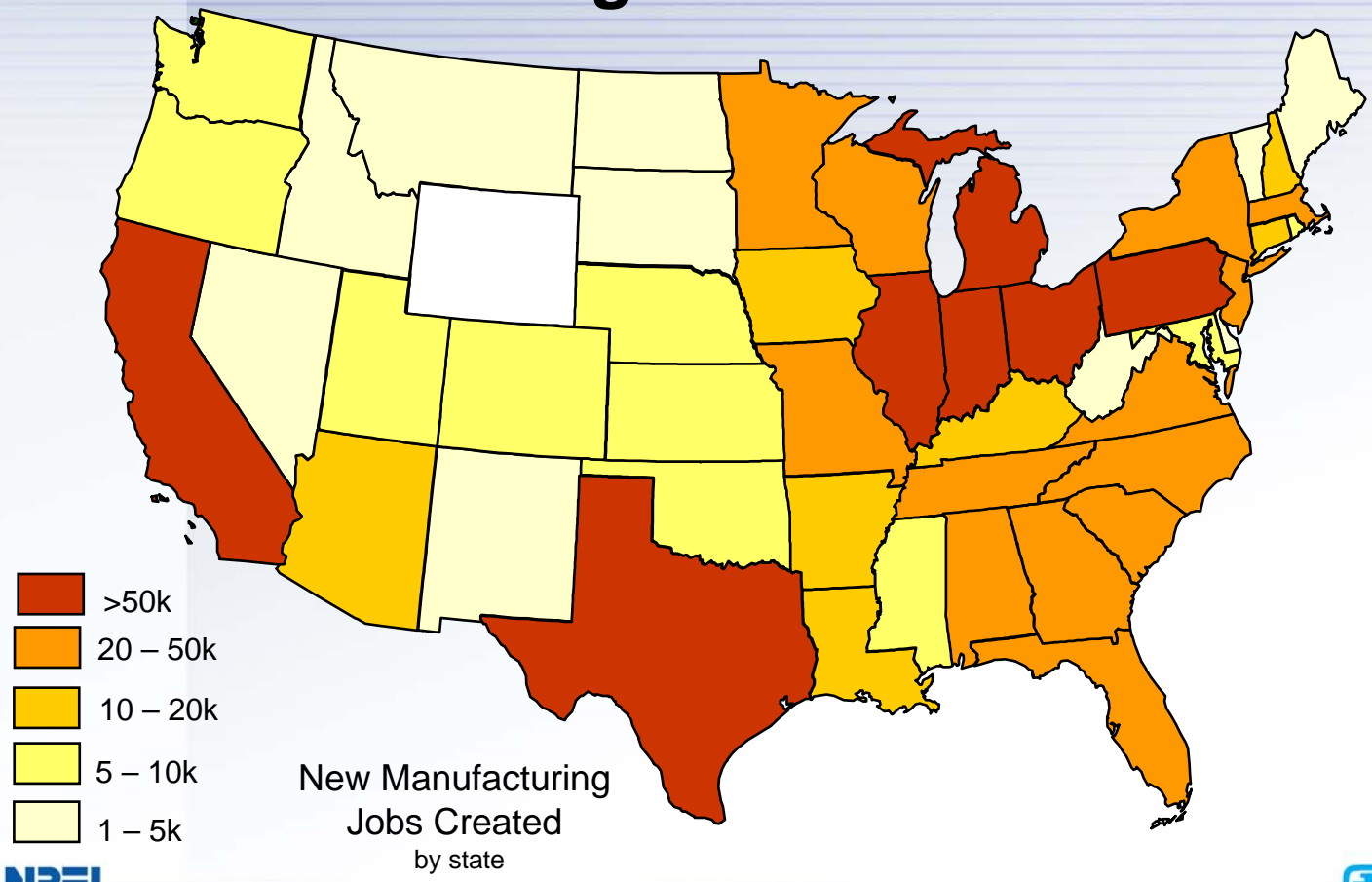
Expands the domestic supply chain

Supply and price security

Domestic jobs

20% Wind Scenario

## New Manufacturing Jobs



# The DOE Role in Manufacturing

- **Material Data Base Development for Industry**
- **Transportation:**
  - **Central Data Base**
- **On-Site/Regional Manufacturing Process Development**
- **Rust Belt to the Green Belt – Transformation:**
  - **Support for training and new manufacturing facilities**
- **Collaboration with Industry for Advanced Manufacturing – Cost Sharing to Reduce Risk**
- **Development of New Manufacturing Approaches**

# The DOE Role in Manufacturing

- **Development of New Manufacturing Approaches and Processes that Drive Innovation**
- **DOE Collaboration to Develop U.S. Suppliers**
- **Need a U.S. Gearbox Suppliers: How?**
  - **Run a design competition that stimulates innovation**
    - High reliability gearbox competition
- **Maybe, a WindPACT type program for permanent magnets and other electrical components:**
  - **WindPACT II Program for all components**
  - **Industry is doing these types of studies**
- **A PVMat type Program for manufacturing**
- **Cost to start a new Gearbox Company is about \$100M**
- **What is the role of the PTC building manufacturing capability in the U.S.**