SMART Wind Consortium

Developing a Consensus-Based

Sustainable Manufacturing, Advanced Research & Technology

Roadmap for Distributed Wind

July 2014

DWEA
DISTRIBUTED WIND ENERGY ASSOCIATION

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

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Wind Advisor Team

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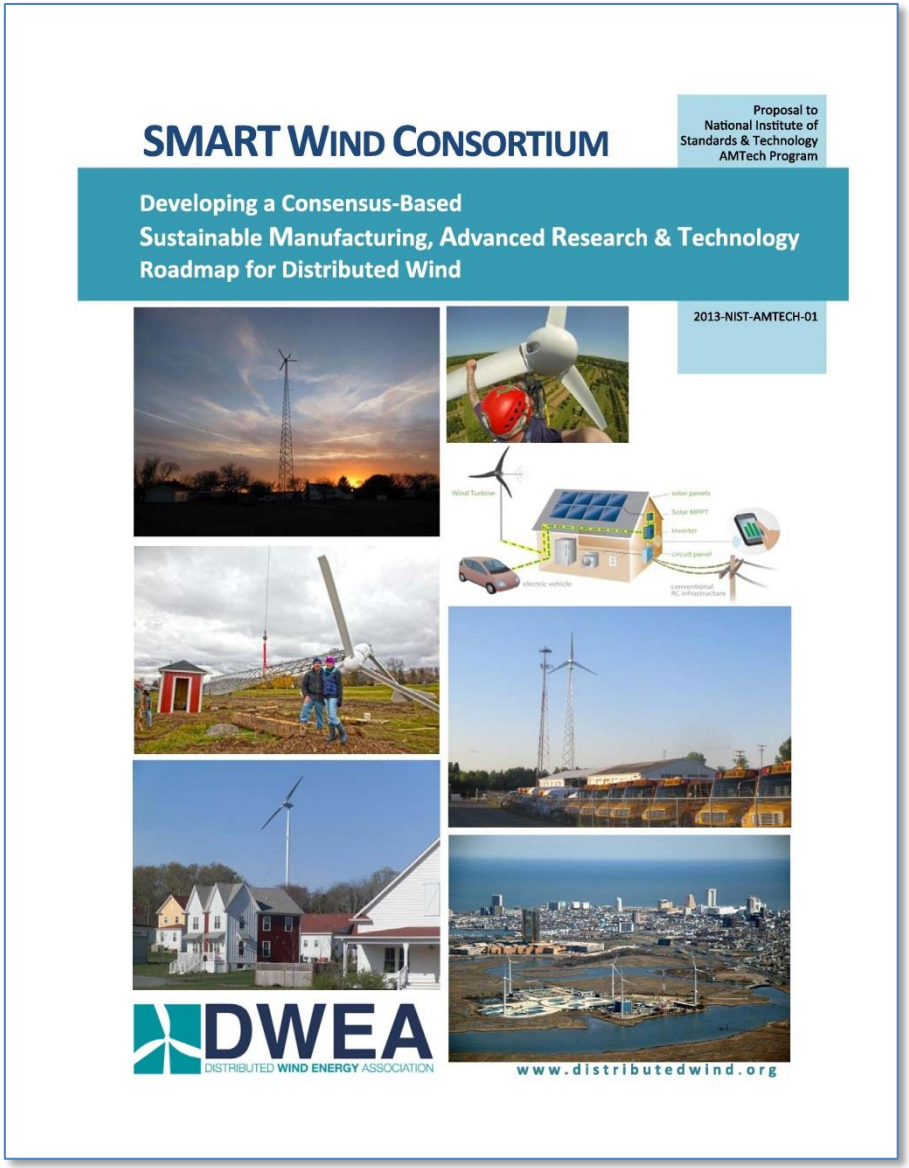
2-year grant awarded to DWEA, supported by eFormative Options and Wind Advisors Team to:

1) Form a **consortium** of DW manufacturers, suppliers, university researchers, manufacturing centers; and

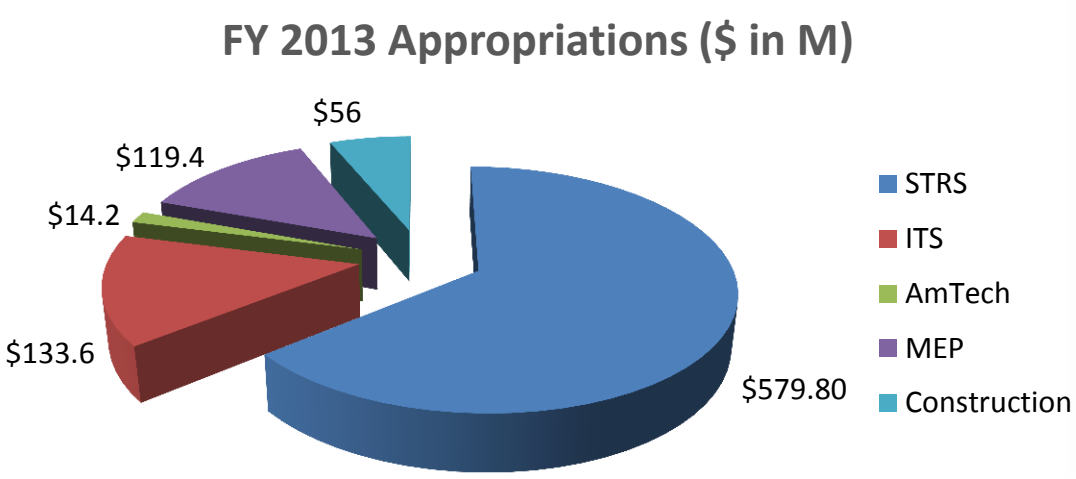
2) Develop a **roadmap** to identify manufacturing gaps, prioritize actions, and foster solutions

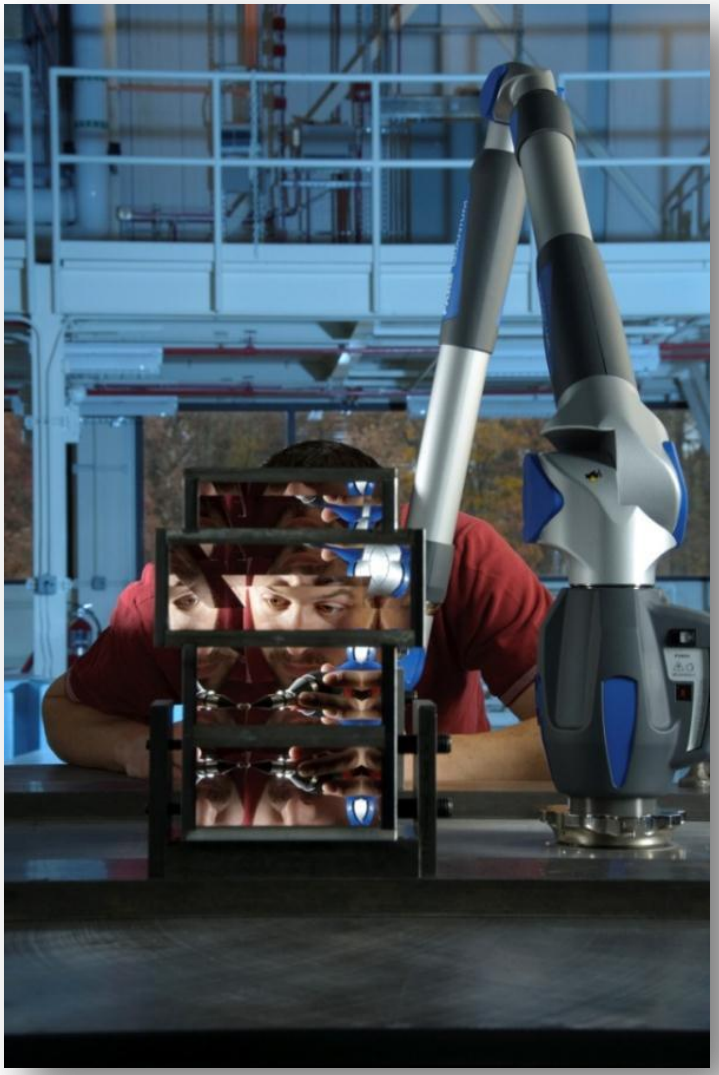
Overall program aim:
Strengthen U.S. manufacturing and innovation performance



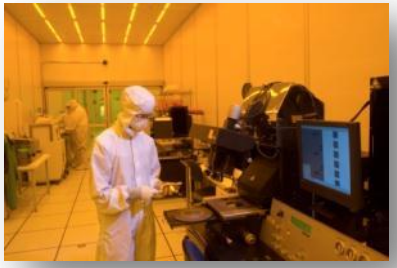
NIST: Basic Stats and Facts

- Major assets
  - ~ 3,000 employees
  - ~ 2,700 associates and facilities users
  - ~ 1,300 field staff in partner organizations
  - Two main locations: Gaithersburg, Md., and Boulder, Colo.
  - Four external collaborative institutes: basic physics, biotech, quantum, and marine science





NIST Programs



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NIST Laboratories

- Providing measurement solutions for industry and the nation

Maksim Dubinsky/shutterstock.com

Hollings Manufacturing Extension Partnership

- Nationwide network helping smaller manufacturers compete globally

Poudre

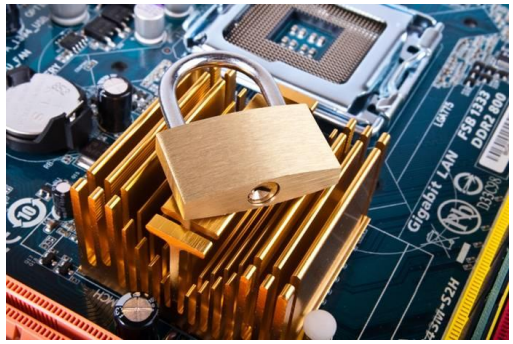
Baldrige Performance Excellence Program

- Strengthening performance excellence in U.S. organizations

NIST's Unique Mission

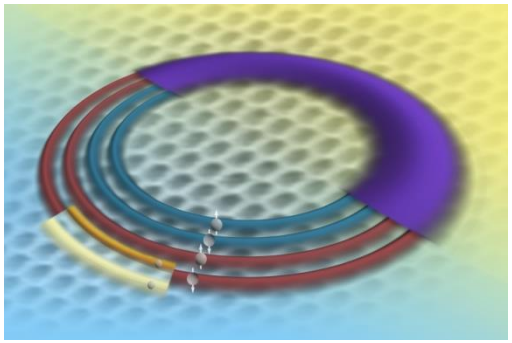
To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

- Mission focus: Targeted programs to advance U.S. innovation and boost economic growth
- Deep research expertise underpins technological innovation – e.g. lasers, memory, GPS, wireless
- Non-regulatory status enables important role as a convener that facilitates collaboration between industry and government



Vector.lib/shutterstock.com

Cybersecurity: Improved response to cyber threats



Nanomanufacturing: New measurement tools for advanced materials manufacturing

techibuzz.com/GM Autos

Energy: Measurements and standards for energy security

NIST Priority Research Areas


TebNad

Advanced Manufacturing


designersart

IT and Cybersecurity


S.Bonk

Healthcare


STILLFX

Forensic Science


NIST

Disaster Resilience


Ensuper

Cyberphysical Systems


Jovan Nikolic

Advanced Communications


Chuck Rausin/shutterstock.com

What is AMTech?

Advanced Manufacturing Technology Consortia (AMTech) Program

- Newly launched by NIST in FY 2013
  - To incentivize the formation of and provide resources to industry-led consortia
    - To support basic and applied research
    - On long-term, pre-competitive and enabling technology development
  - For the U.S. manufacturing industry

- AMTech-supported consortia will strengthen the capacity of U.S. industry and the nation to compete in global markets

How Will AMTech Work?

- FY 2013 AMTech *planning awards* will fund eligible applicants to create new or strengthen existing industry-led technology consortia
- AMTech-supported consortia will:
  - Identify and prioritize long-term, pre-competitive industrial research needs;
  - Enable technology development;
  - Create the infrastructure necessary for more efficient transfer of technology;
  - Represent a broad range of involved firms across stages of the value chain.
- Once fully implemented, NIST envisions AMTech to offer funding in two broad areas: *planning awards* and *implementation awards*

2013 AMTech Planning Grants

Intended to:

- Establish and strengthen industry-led consortia focused on developing advanced technologies to address major technical problems that inhibit growth of advanced manufacturing in the U.S.
- Identify and prioritize research projects supporting long-term industrial research needs and activities including creating or updating existing industry-led, shared-vision roadmaps for development of technologies underpinning next-generation and/or transformational innovations
- Undertake other activities designed to establish and strengthen industry-led, multi-partner consortia that catalyze technology infrastructure and American excellence in advanced manufacturing

AMTech Competition Results

Consortia Characteristics

Consortium Status: **11 New**
8 Existing

Crosscutting Technologies (# of efforts)

1 - Additive Manufacturing
2 - Advanced Forming & Joining Technologies
7 - Advanced Manufacturing & Testing Equipment
2 - Advanced Materials Design, Synthesis & Processing
1 - Advancing Sensing, Measurement & Process Control
1 - Biomanufacturing & Bioinformatics
1 - Flexible Electronics Manufacturing
2 - Sustainable Manufacturing
2 - Visualization, Informatics & Digital Manufacturing Technologies

Full list at www.nist.gov/amo

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Industry Participation

DWEA speaks for all the Major Players

Northern POWER SYSTEMS

Endurance wind power

BERGEY WINDPOWER

JUHL WIND INC.

UL

RENEWABLE PNE ENERGY

Harvest THE WORLD NETWORK

FOUNDATION WINDPOWER

SED SUSTAINABLE ENERGY DEVELOPMENTS™

EWT

IWT IOWA WIND TURBINES, LLC

SEMINOLE FINANCIAL SERVICES RENEWABLE ENERGY FINANCE

Intertek

Wind Turbines of Vermont
Power is a breeze.

Pika

UNITEDWIND

CleanEnergy States Alliance

access america transport

COHN REZNICK
ACCOUNTING • TAX • ADVISORY

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Con·sor·tium: *an agreement, combination, or group (as of companies) formed to undertake an enterprise beyond the resources of any one member*

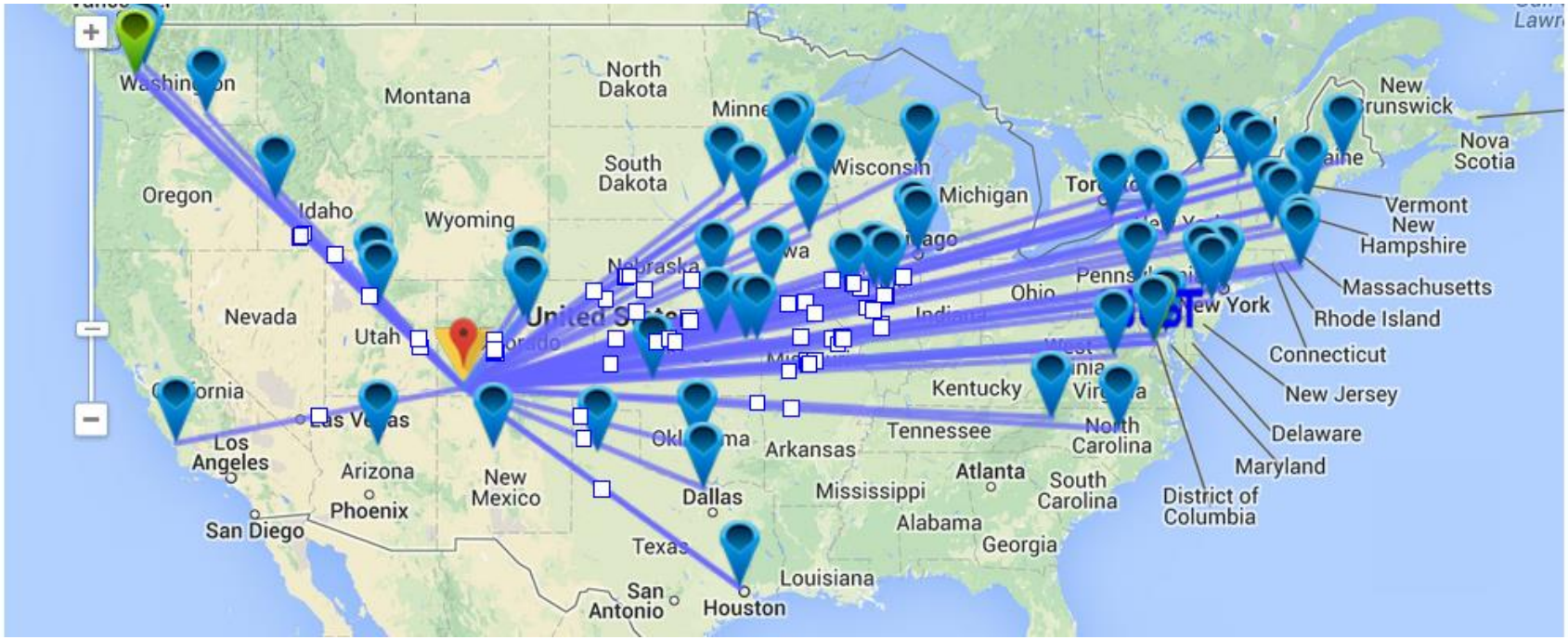

Image courtesy NIST

SMART Wind Consortium will connect more than 80 collaborators to form consensus on near-term and mid-term plans needed to increase cost competitiveness through the use of advanced manufacturing techniques

www.distributedwind.org/smart-wind-sign-up/

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Academic-Research University Participation

Alternative Energy Institute

ADVANTAGE KENTUCKY ALLIANCE

Colorado State University
Wind Application Center
Department of Mechanical Engineering

PENNSTATE
1855

Appalachian State University

kwac
kansas wind applications center

BOISE STATE UNIVERSITY

CAL POLY
WIND POWER

Virginia Center for Wind Energy

MAINE

WESTERN ILLINOIS UNIVERSITY

KANSAS STATE UNIVERSITY
Department of Civil Engineering

VMEC
VERMONT MANUFACTURING EXTENSION CENTER

UMASS
University of Massachusetts Lowell

WindSTAR
Wind-Energy Science, Technology, and Research
Industry/University Cooperative Research Center

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Core Team

DWEA Executive Director
Jennifer Jenkins

Project Manager
Heather Rhoads-Weaver
eFormative Options

Technical Lead
Trudy Forsyth
Wind Advisors Team

DWEA Communications Manager
Lauren Glickman
WindyGlick

Technical Co-Lead
Brent Summerville
Summerville Wind & Sun

Why Distributed Wind: Benefits to America

- Promotes more energy choices for Americans
- Plays to American technology and manufacturing strengths
- Creates long-term sustainable jobs
- Strengthens exports
- Increases private sector investment in clean energy
- Places more wind energy in the public eye

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Distributed Wind's Diverse Market Potential

Residential

Schools

Commercial

Military

Farms

Public

Foreign Assistance

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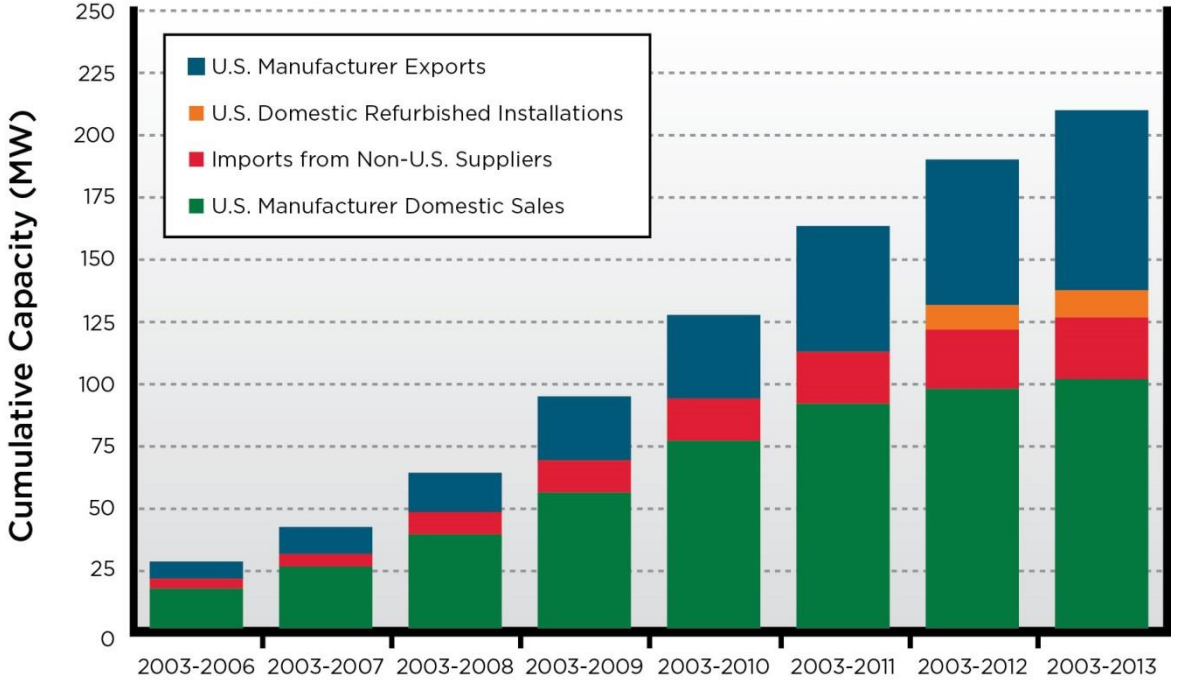
U.S. Small Wind Domestic, Imports, and Export Sales



Estimated Total Available Market

(2030 Theoretical Potential)

Market Segment	2013 Size, Units	Data Source	2030 Size, Units	Percent Suitable	2030 Potential Installed Units	Average Size (kW)	Potential (MW)
Businesses	8,900,000	Census, 2008	14,300,000	15%	2,145,000	350	750,750
Rural Residential	30,600,000	HUD, 2009	49,100,000	50%	24,550,000	10	245,500
Farm	2,200,000	USDA, 2007	2,200,000	60%	1,320,000	150	198,000
Public Buildings	1,200,000	DWEA Estimate	1,350,000	25%	337,500	250	84,375
Schools	140,000	NCES, 2010	165,000	40%	66,000	250	16,500

Total Potential (MW): 1,295,125

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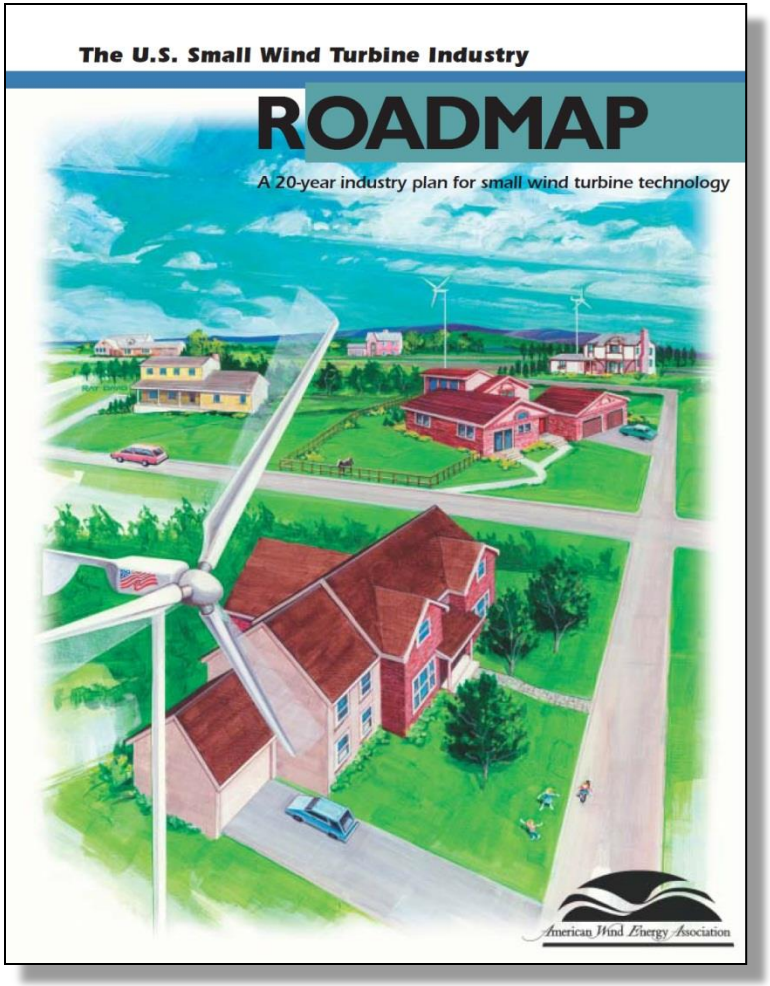

Last Small Wind Industry Roadmap was produced in 2002

SMART Wind project will identify and prioritize cost-effective solutions so U.S. distributed wind industry can claim its share of projected potential global $2 trillion market

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Initial SMART Wind strategies

- Identify common distributed wind manufacturing gaps and barriers
- Prioritize solutions to those gaps for today and for future scalability
- Facilitate a rapid transfer of innovation into American-manufactured wind turbines, open new market opportunities, expand distributed wind applications
- Reduce lifecycle costs, maintain high product quality and value
- Secure U.S. global competitiveness and leadership

photo courtesy Endurance Wind Power

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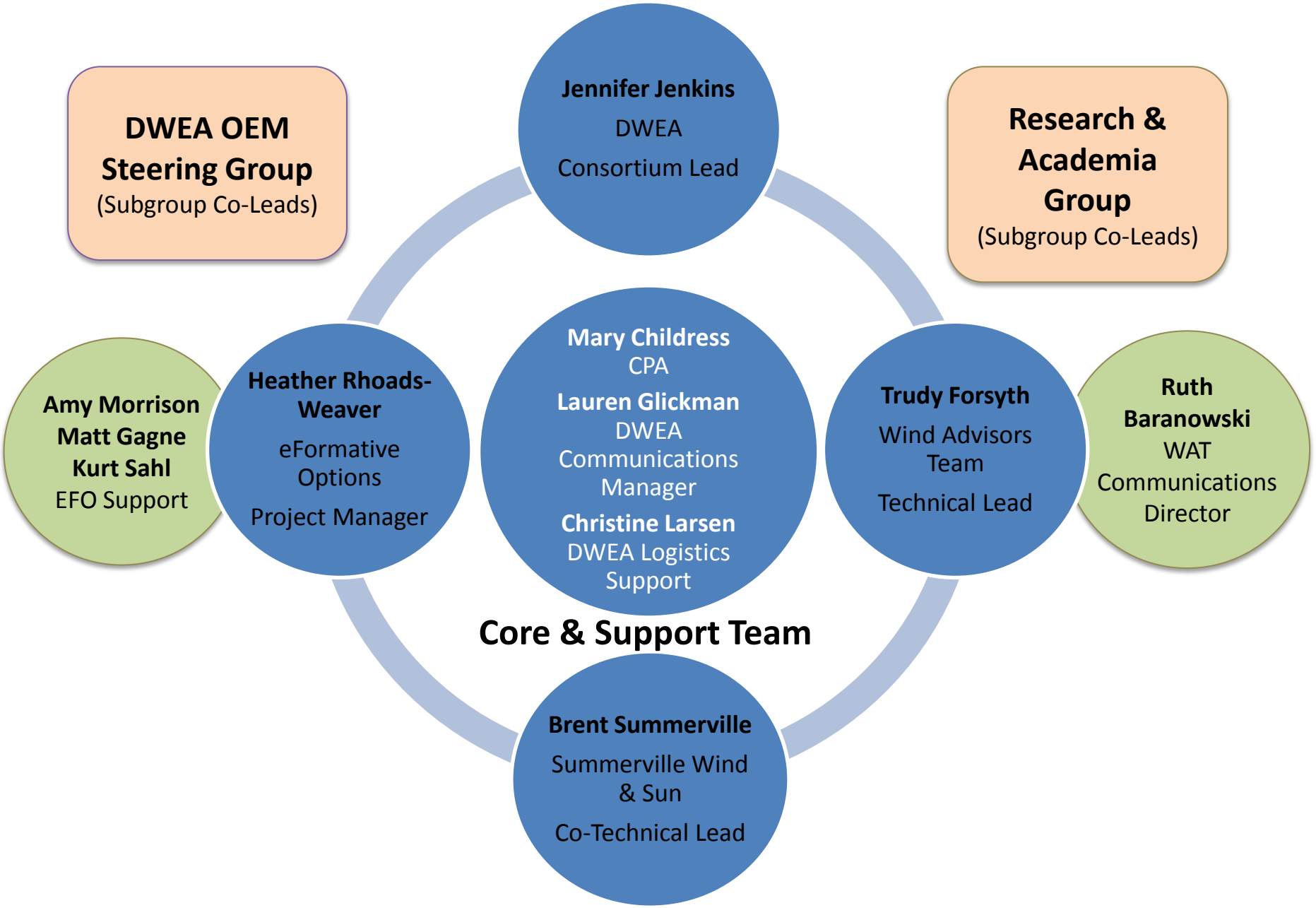
Consortium Meetings

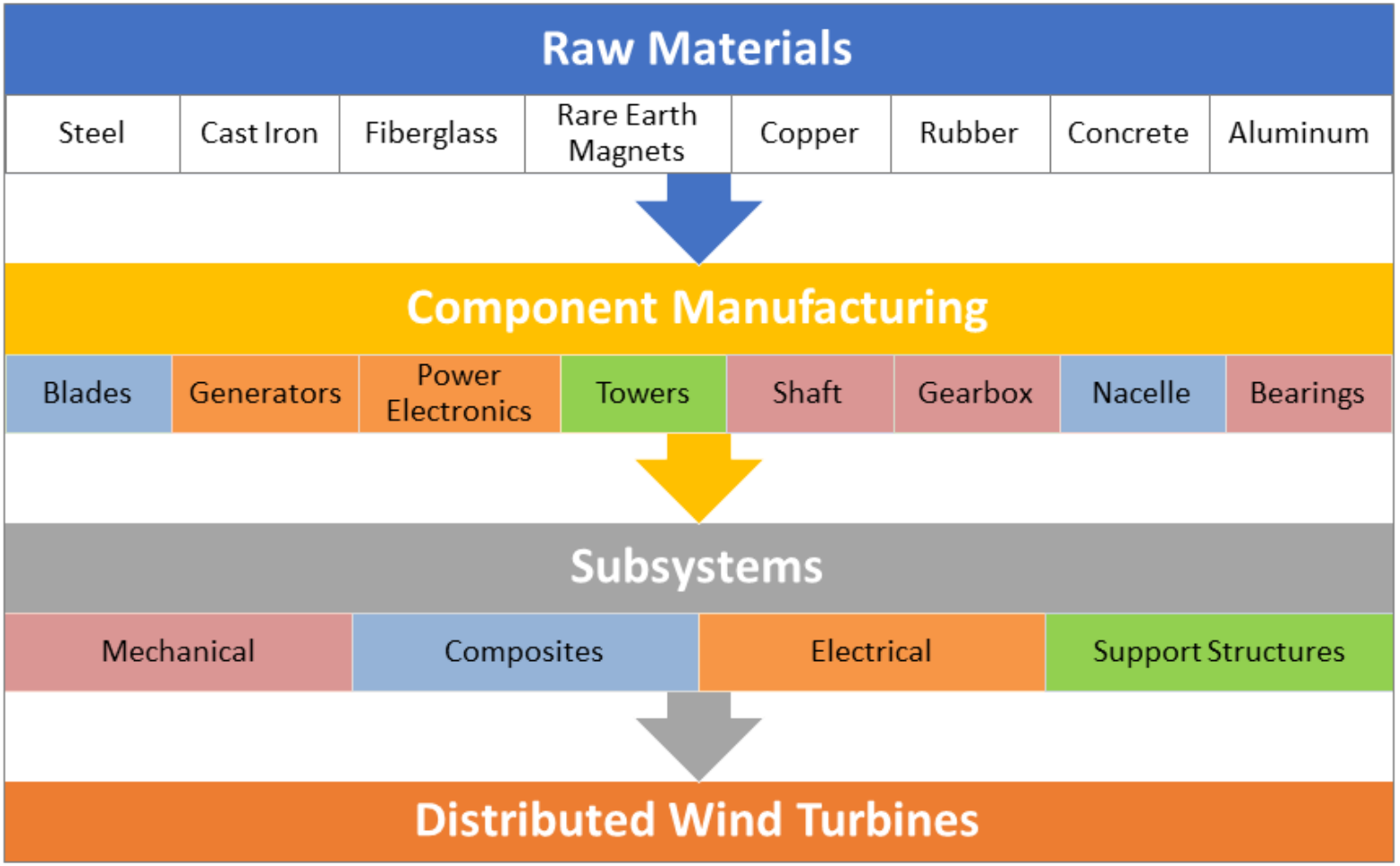
- Bring together critical U.S. distributed wind turbine and component manufacturers to maintain edge in a growing global market
- Leverage industry-academic dialogue to develop strategies to aid distributed wind industry growth and advance innovative manufacturing techniques
- Share ideas and forge ahead as global leaders in the growing market of distributed wind

photo courtesy Northern Power Systems

Consortium Organization



Consortium Structure: DW Supply Chain



Electrical Systems
- Inverter
- Controller
- Alternator
- Power electronics
- Generator
- Magnets
- Bus bars
- Slip rings
- Interconnection
- System monitoring

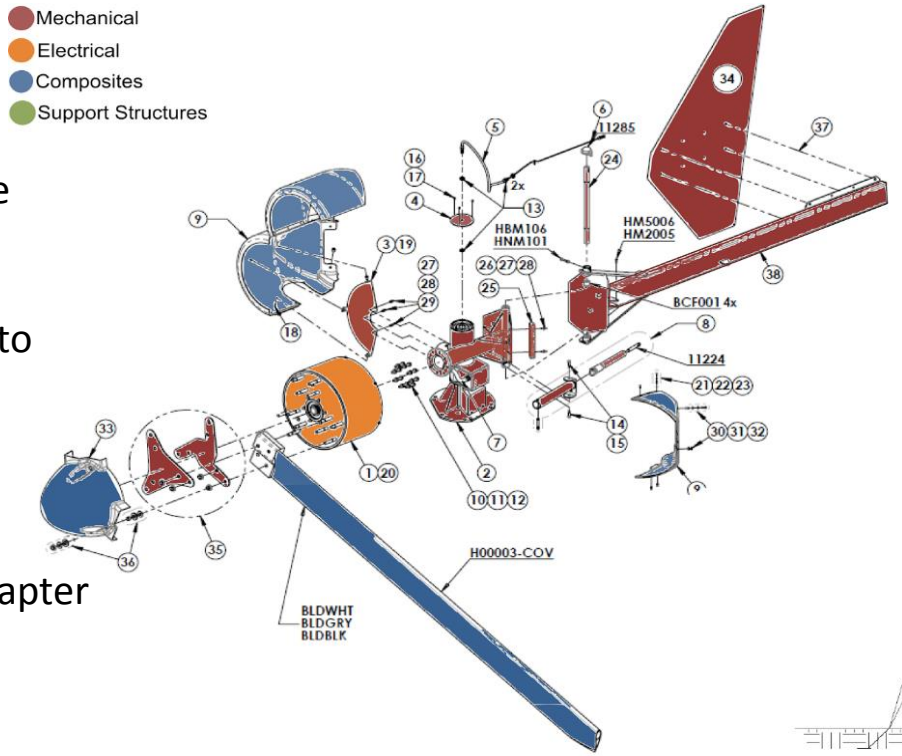
Distributed wind energy turbine systems, subsystems, components and piece parts divided into four subgroups

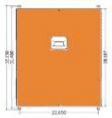
Mechanical Systems
- Shafts
- Bearings
- Braking system
- Gearbox
- Pitching system
- Furling system
- Yaw system

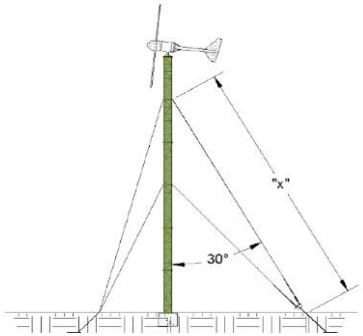
Composites
- Blades
- Nacelle housing
- Nosecone
- Tower

Support Structures
- Tower
- Access ladder
- Foundation
- Anchoring System
- Permitting

Subgroup Boundaries

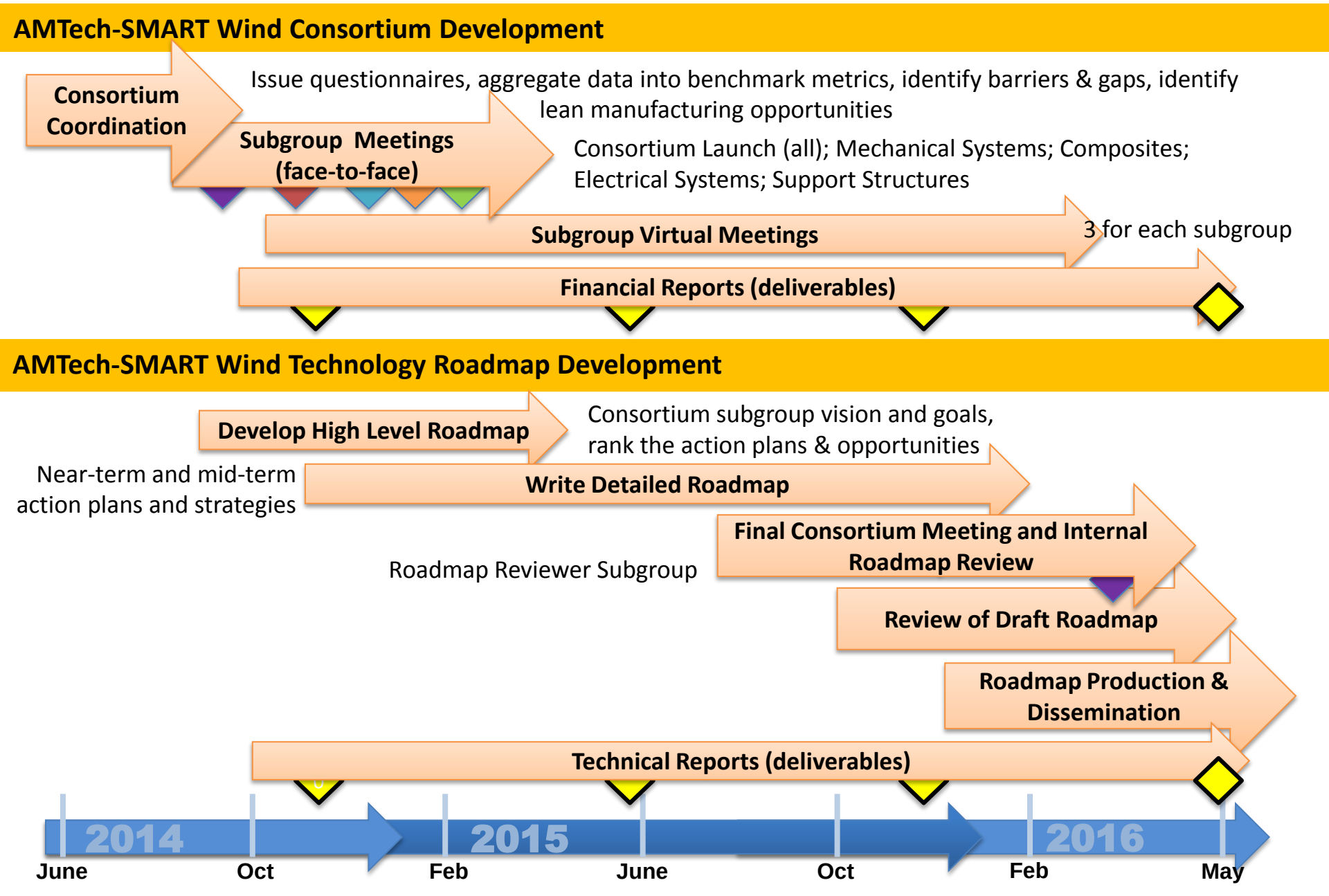



Inverter



- **Mechanical subsystems**
  - Boundary vs. Support Structure is the tower top
  - Rotor, hub, mainshaft, mainframe: Rotor connection to generator, generator support
  - Overspeed control/yaw mechanism (i.e pitching, furling, yawing)
  - Tower top/bed plate, tower adapter
- **Electrical subsystems**
  - Generator
  - Power electronics
  - Balance of system electrical components (all the way up to the electrical service; transformer, bus bars, slip rings, etc.)
- **Composite subsystems**
  - Anything using fiber-reinforced or carbon resins including: blades, nose cones, nacelles, etc.
- **Support structure**
  - Tower, bolts, foundation, rebar, guy wires, guy clamps, ground anchors, lifting device for tilt-down tower, etc.

Roadmapping SMART Wind Schedule



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SMART Wind Consortium In-Person Meetings

	Meeting	Location	Date
	Project Meet & Greet, Initial Steering Meeting	Stevens Point, WI	June 17 and 19, 2014 In conjunction with Small Wind Conference
1	Consortium Launch	Albany, NY	October 15-16, 2014 In conjunction with DWEA All-States Summit
2	Mechanical Systems Subgroup	Denver, CO	November 12-14, 2014
3	Support Structures Subgroup	Denver, CO	January 13-14, 2015
4	Composites Subgroup	Denver, CO	February 16-18, 2015
5	Electrical Systems Subgroup	Washington, DC	March 25-27, 2015 In conjunction with DW15 Hill Event
6	Roadmap Prioritization	Washington, DC	March 2016
	Finalize, Produce & Distribute Roadmap		Project Completion: May 31, 2016

Register at www.distributedwind.org/smart-wind-consortium

Information Protection

- NIST protects the confidential and proprietary information about business operations and trade secrets possessed by any company or participant to the full extent of the law.
- NIST will withhold such information from disclosure pursuant to the applicable statutory authorities:
  - Freedom of Information Act (FOIA) 5 U.S.C. § 552(b)
  - Economic Espionage Act 18 U.S.C. § 1832
  - Trade Secrets Act 18 U.S.C. § 1905
- Mark **all** documents with confidential information "proprietary"
- Remember, e-mail may not be secure

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Questions, discussion

http://distributedwind.org/smart-wind-faqs/

photo courtesy Endurance Wind Power

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To sign up for Subgroups or more information:

www.distributedwind.org/smart-wind-sign-up/

lglickman@distributedwind.org

www.distributedwind.org/events/smart-wind-consortium-launch

Register today for Oct 16 Launch Meeting – rates increase after Aug 24!