APPALACHIAN WIND ENERGY SUPPLY CHAIN INITIATIVE

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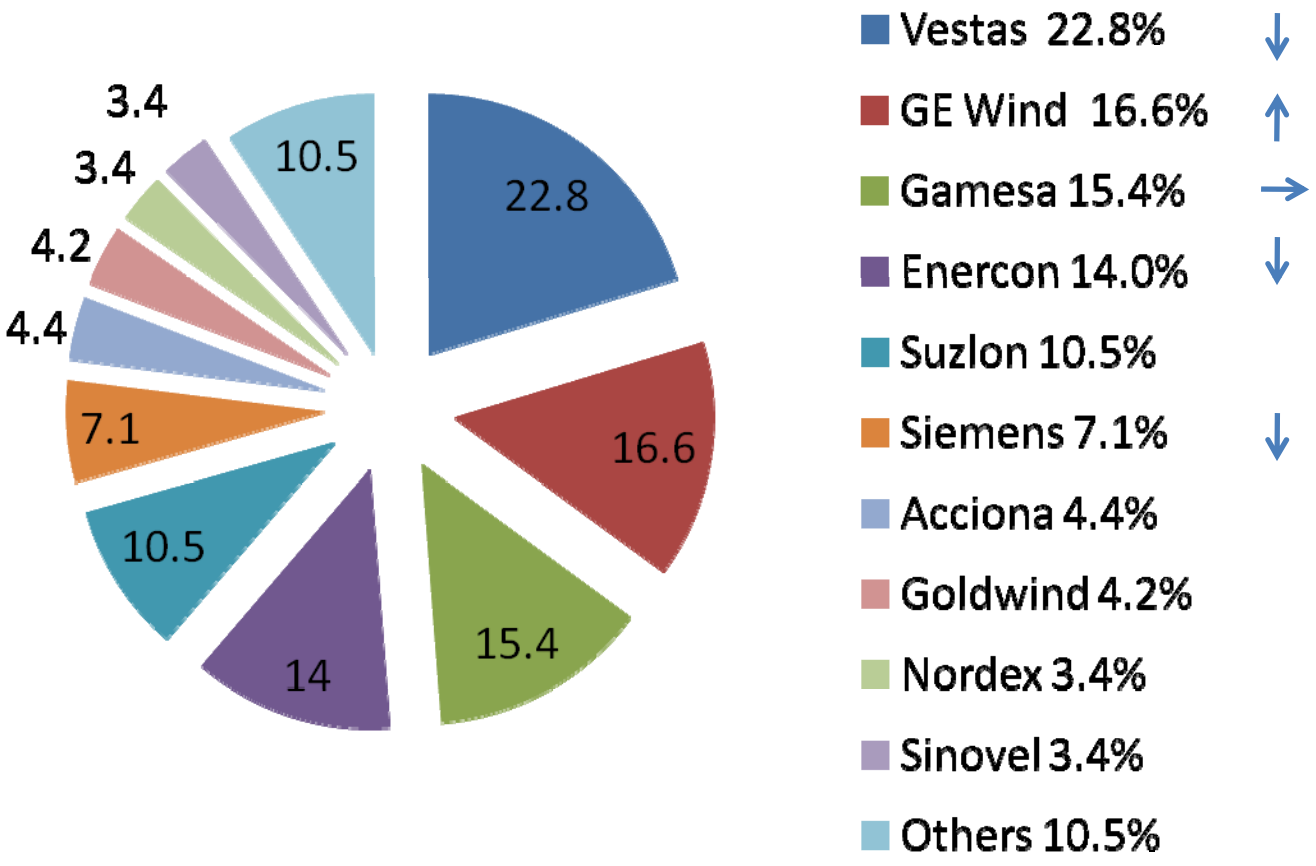
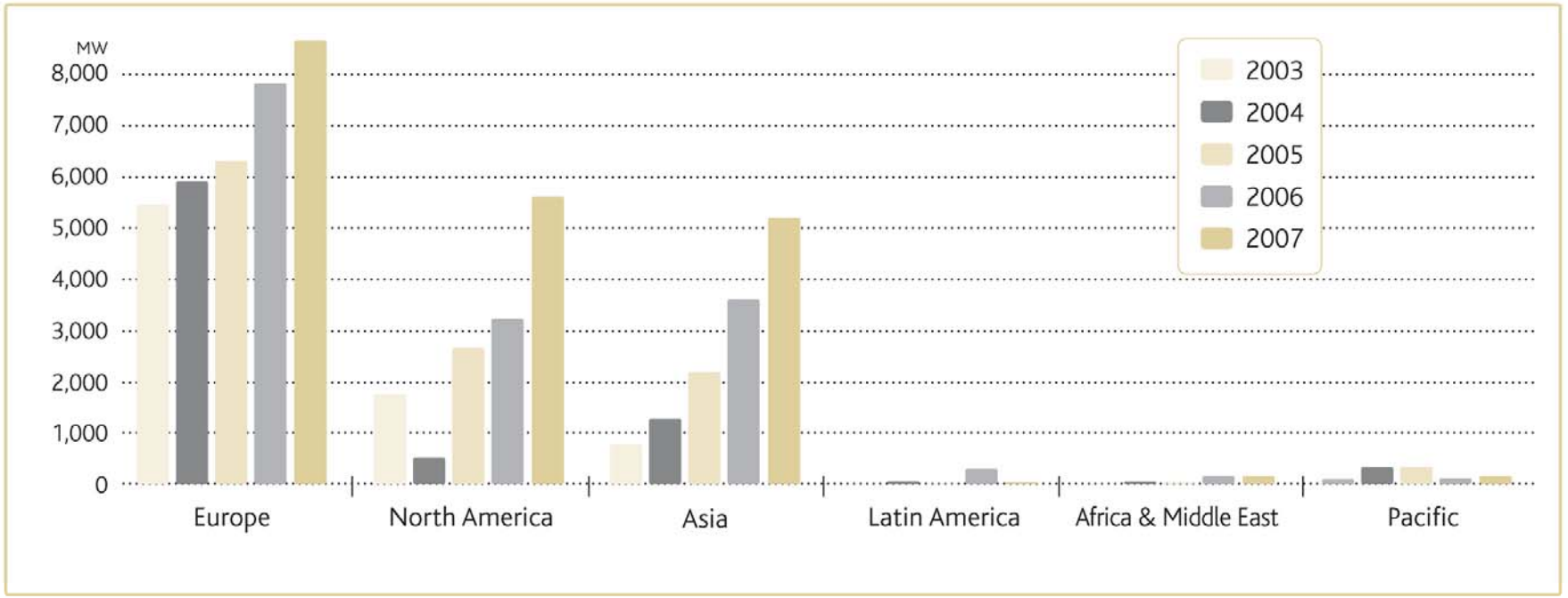
Pennsylvania Wind Energy Symposium 2008:
Power For The Future
November 18, 2008

GLOBAL TURBINE SALES 2007*

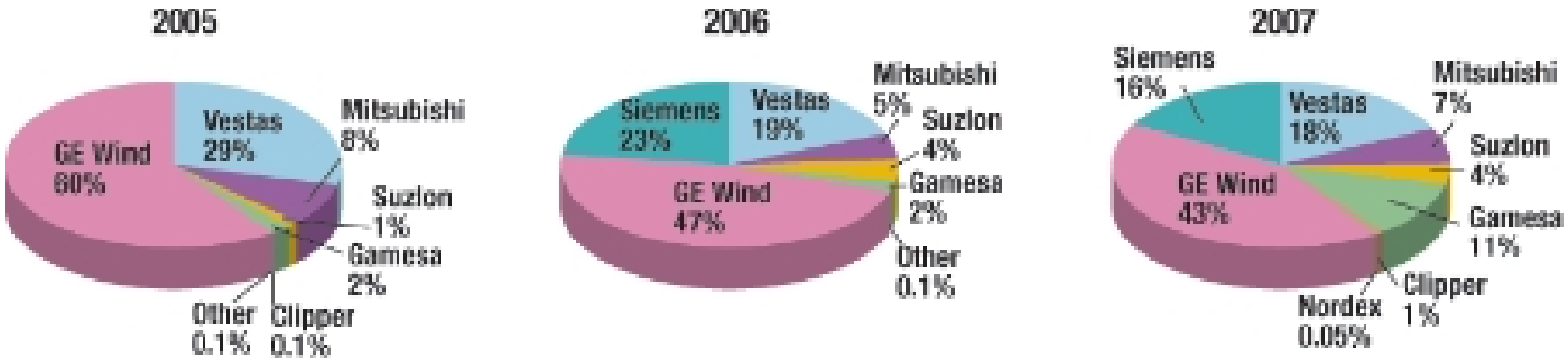


* The top-5 global manufacturers had a total market share of 85.5% in 2004. Arrows indicate direction of change from 2006.

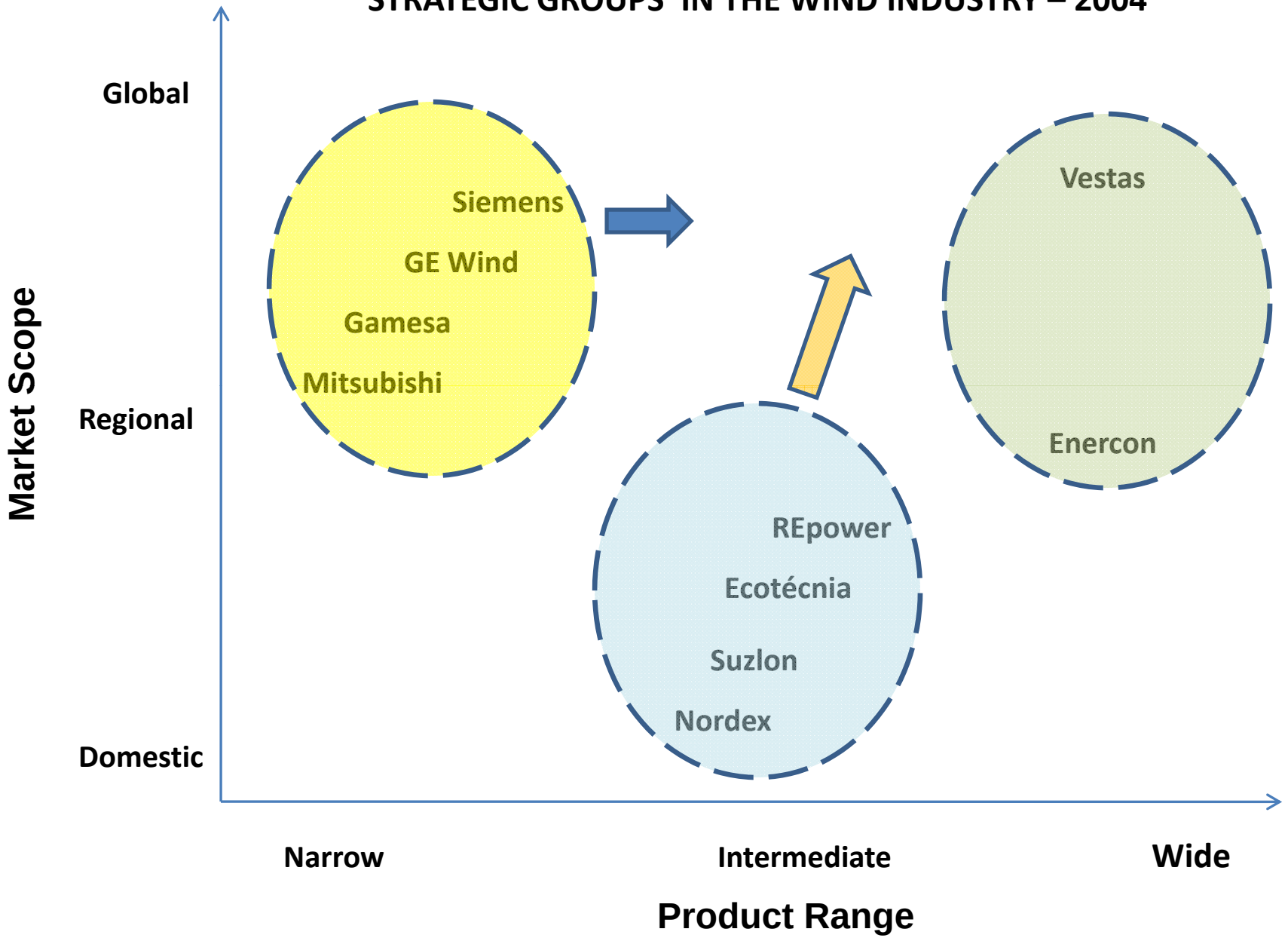
ANNUAL INSTALLED CAPACITY BY REGION 2003-2007



ANNUAL U.S. MARKET SHARE OF WIND MANUFACTURERS BY MW, 2005-2007



STRATEGIC GROUPS IN THE WIND INDUSTRY – 2004*



* Adopted from: Wied, M., Windy Prospects: An Approach to Strategic Foresight in the Global Wind Turbine Industry, 2007

Companies	Product Line Range		
	Turbine Size (MW)	Rotor Diameter	Hub or Tower Height
Vestas	850KW	52m	44m,49m,55m,65m,74m
	1.65 MW	82m	78m,70m, 80m
	1.8MW	80m	60m,67m,78m,100m;
	2.0 MW	90m	80m,95m,105m
	3.0MW offshore	90m	80m,105m
GE Wind	*1.5MW*	77m, 82.5m	65m,80m
	2.5 MW	100m	75m,65m,100m
	3.6MW offshore	111m	Site dependent
Gamesa	850KW	52m, 58m	44m, 55m, 60m, 65m 71m
	2.0MW	80m, 83m, 87m, 90m	67m,100m
Enercon	330 KW	33.4m	30m,50m
	900 KW	44m	45m,55m
	800 KW	48m, 52.9m	50m,70m/60m,73m
	2.3MW	71m	64m,113m
	2.0 MW	82m	78m,138m
Suzlon	950 MW	64m	56m/65m/74m
	1250 MW	64m, 66m	56m/65m/74m
	2.1MW	88m	80m
Siemens	*2.3MW, 2.3 VS*	82m, 93m	60m,80m or site specific
	3.6MW offshore	107m	70m,80m or site specific
Acciona	*1.5MW*	70m, 77m, 82m	60m, 71.5m, 80m
	3.0 MW (prototype)	100m, 109 m, 116 m	100m
Goldwind	600 KW	43m	40m/50m
	750 KW	49m	50m/60m
	1.2 MW	62m	70m
	1.5MW	70.5m	65m/85m
Nordex	1.5MW	70m, 77m	65m, 61.5m
	2.3MW/2.5MW, off shore	80m, 90m	70m,75m,80m,100m,120m
Sinovel	1.5MW		
	3.0MW (prototype)		

TURBINES INSTALLED IN THE U.S. IN 2007
(in number of turbines and total MW)

	Size	# Turbines	Total MW
GE Wind	1.5 MW	1561 turbines	2342 MW
Vestas	1.65 MW	537 turbines	953 MW
Siemens	2.3 MW	375 turbines	863 MW
Gamesa	2.0 MW	242 turbines	484 MW
Mitsubishi	1.0 MW	356 turbines	356 MW
Suzlon	2.1 MW	97 turbines	197 MW
Clipper	2.5 MW	19 turbines	48 MW
Nordex	2.5 MW	1 turbine	2.5 MW

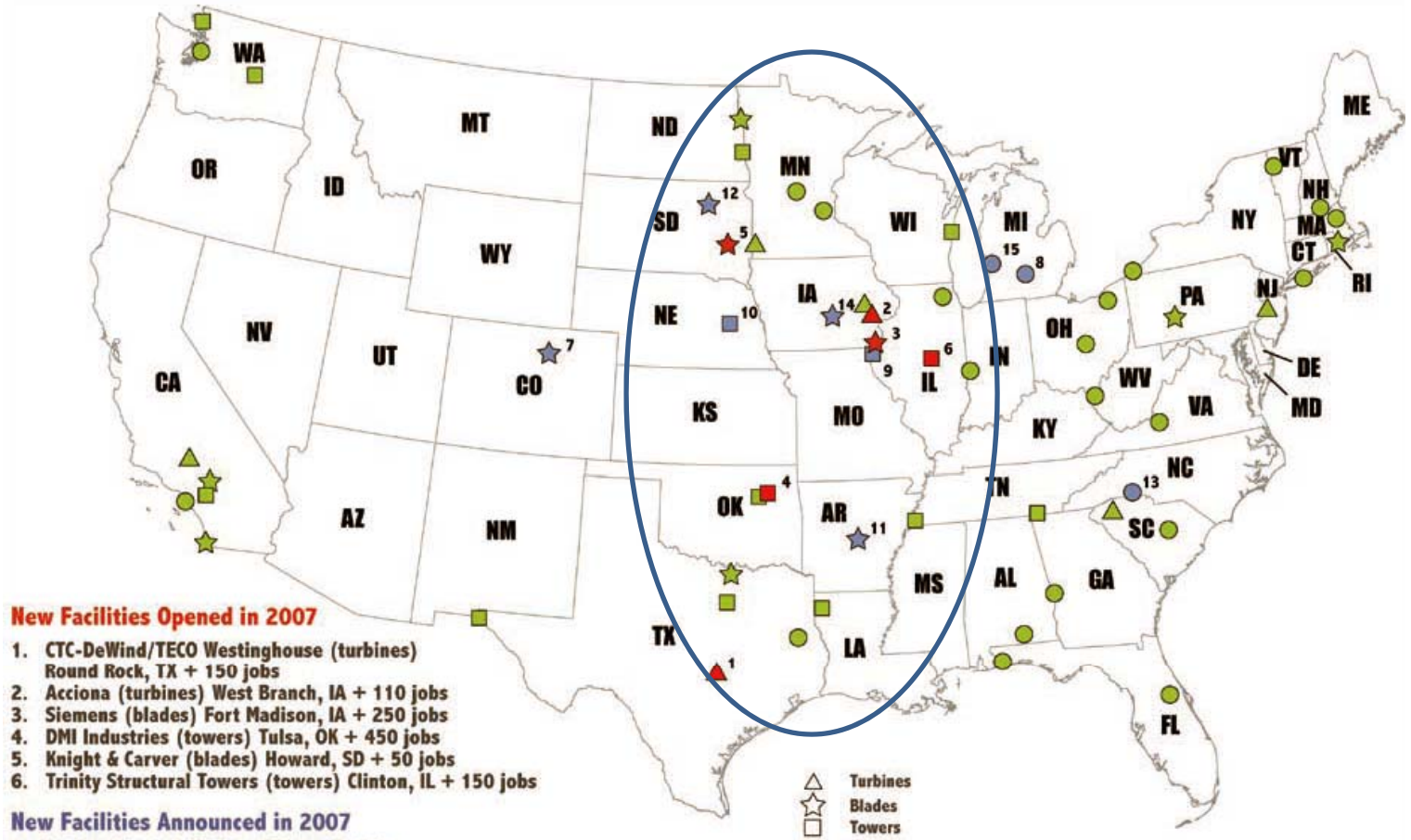
5329 MW OF NEW WIND CAPACITY WERE ADDED IN 2007

The top five U.S. states in capacity additions
Texas (1618 MW)
California (776 MW)
Illinois 592 MW)
Oregon (447 MW)
Minnesota (405 MW).

The top five states in installed capacity
Texas (4356 MW)
California (2439 MW)
Minnesota (1299 MW)
Iowa (1273 MW)
Washington (1163 MW)

Installed capacity in Appalachian States*
New York (425 MW, Ranked 11)
Pennsylvania (294 MW, Ranked 14)
West Virginia (66 MW, Ranked 20)
Tennessee (29 MW, Ranked 25)
Ohio (7 MW, Ranked 27)

* Under construction or completed in 2008
New York: Noble Bliss (100.5 MW), Noble Clinton (100.5 MW), Noble Ellenburg (81 MW), Dutch Hill/Cohocton (125 MW), Noble Altona (97.5 MW), Noble Bellmont (21 MW), Noble Chateagay (106.5 MW), Noble Wethersfield (126 MW), Sheldon Energy (112.5 MW)
Pennsylvania: Forward (29.4 MW), Highland Wind Project, (62.5 MW) Locust Ridge II (102 MW), Lookout (38 MW), Allegheny Ridge/Portage (70 MW)
West Virginia: NedPower Mount Storm I (164 MW), NedPower Mount Storm II (100 MW)



New Facilities Opened in 2007

1. CTC-DeWind/TECO Westinghouse (turbines) Round Rock, TX + 150 jobs
2. Acciona (turbines) West Branch, IA + 110 jobs
3. Siemens (blades) Fort Madison, IA + 250 jobs
4. DMI Industries (towers) Tulsa, OK + 450 jobs
5. Knight & Carver (blades) Howard, SD + 50 jobs
6. Trinity Structural Towers (towers) Clinton, IL + 150 jobs

New Facilities Announced in 2007

7. Vestas (blades) Windsor, CO + 650 jobs
8. Dowding Industries (turbine components) Eaton Rapids, MI + 200 jobs
9. Hendricks Industries (towers) Keokuk, IA + 350 jobs
10. Katana Summit (towers) Columbus, NE + 120 jobs
11. LM Glasfiber (blades) Little Rock, AR + 1,000 jobs
12. Molded Fiberglass (blades) Aberdeen, SD + 750 jobs
13. PPG Industries (fiberglass) Shelby, NC + not available
14. TPI Composites (blades) Newton, IA + 500 jobs
15. Genzink Steel (nacelles) Holland, MI + 10 jobs

Figure includes wind turbine and component manufacturing facilities, as well as other supply chain facilities, and excludes corporate headquarters and service-oriented facilities. The facilities highlighted here are not intended to be exhaustive. Those facilities designated as "turbines" may include turbine assembly as well as component manufacture including, in some cases, towers and blades.

NREL

This map was created by The National Renewable Energy Laboratory for the U.S. Department of Energy. April 16, 2008

WIND TURBINE SUPPLIERS AND LOCATIONS

Types of Suppliers	Headquarters	U.S. Manufacturing Sites
Gearbox Suppliers		
Bosch Rexroth	Witten Germany	Bethlehem, PA
Brad Foote Gear Works	Cicero, IL	Cicero, IL
Echesa S.A. (Gamesa Energy Transmission	Asteasu, Spain	
Eickhoff	Bochum, Germany	Pittsburgh, PA
Fellar, S.A.	Valencia, Spain	
Hansen Transmission	Edegem, Belgium	Verona, VA
Ishibashi Manufactruing Co., Ltd	Nogata, Japan	
Jahnel-Ketsreman Getriebewerke (JaKe)	Bochum, Germany	
Leroy-Somer	Saint Louis, MO	
Moventas	Jyvaskyla, Finland	IL, NC, SC, MS, TX, OK, NJ
Pujol Muntala	Barcelona, Spain	
Renk AG	Augbery, Germany	Duncan, SC
Winergy	Bochert, Germany	Elgin, IL
Chinese Gearbox Suppliers		
China High Speed Transmssion Equipment	Nanjing, China	
Chongqing Gearbox Co., Ltd	Chongqing, China	
Hangzhou Advance Gearbox Group Co.	Hangzhou/Zhejiang, China	
Bearing Suppliers		
Kaydon	Ann Arbor, MI	SC (2), NC, OH, MI
NTN Corporation	Osaka, Japan	Mount Propspect, IL
SKF Group	Goteburg, Sweden	PA, NY (2), CN, SC, KY
The Timken Company	Canton, OH	Union, SC
Wangfangdian	Dalian, China	
Generators		
ABB	Zurich, Switzerland	New Berlin, WI
Elin	Weiz, Austria	
Weier (Vestas)	Eutin, Germany	

WIND TURBINE SUPPLIERS AND LOCATIONS

Type of Supplier	Appalachian Counties (in parentheses)
Nacelle covers and frames	
Blades, blade extenders, hubs	CAB Inc. , (Hall); Hodge Foundry, Inc., Greenville, PA (Mercer); Gamesa, Ebensburg, PA (Cambia)
Gearboxes	Peerless Winsmith, Inc., (Otsego); Hodge Foundry, Inc., Greenville, PA (Mercer); Renk AG, Duncan, SC (Spartanburg), Eickhoff, Pittsburgh, PA (Allegheny)
Bearings	Moventas, Winston-Salem, NC (Forsyth); Moventas, Greenville, SC (Greenville); Kaydon, Mocksville, NC (Davie); SKF Falconer, NY (Chautauqua), SKF, Jamestown, NY (Chautauqua)
Generators/Inverters/Power Electronics	Motors and Control International, Hazelton, PA (Luzerne)
Towers, including base, flanges and bolts	Aerisyn, Chattanooga, TN (Hamilton); CAB Inc., Oakwood, GA (Hall)
Construction, Consulting, and Maintenance Services, communications systems	Specialized Power Systems, Inc. Huntington, West Virginia (Cabell), Genesis Development of Kentucky, LLC (Pike); Emerson Process Management, Pittsburgh, PA (Allegheny)

ISSUES FOR DOMESTIC SUPPLIERS TO CONSIDER

- A considerable number of new and expanding facilities are for towers and blades. Tower and blades are too large and expensive to export into the United States, so must be built relatively close to where they will be installed.

- Most wind turbine manufacturers located in the U.S. are not sourcing the majority of their components domestically, including American companies

- A few foreign manufacturers are beginning to assemble products in the United States (Acciona, Nordex, Gamesa), but are not fabricating many turbine components domestically.

- The components that are sourced domestically are not critical to differentiating the product from those of competitors, e.g., nacelle housings, machining transmission housings. Rather, components that have this impact are imported from the turbine manufacturer's home country or region.

IMPLICATIONS OF SUPPLY-CHAIN DEVELOPMENT FOR JOB CREATION IN APPALACHIAN REGION

- REPP's* estimates for job creation from wind power may be too optimistic. The assumption is that 1000 MW of additional installed capacity would create 3000 manufacturing jobs, 700 installation jobs, and 600 operations and maintenance jobs.

- Estimates for installation and operations and maintenance jobs seem reasonable, but the largest number of these jobs would be in California, Texas, etc.

- Last year's increase of 5329 MW should have created 22,915 jobs. This year's projected increase of 7500 MW should create 32,250 jobs. DOE's required 16000 MW/year until 2030 would create 68,800.**

- Should we take productivity improvements into account (9% per year)?

- Renewable Energy Policy Project "Wind Turbine Development: Location of Manufacturing Activity", September 2004.

** Excludes indirect and induced impacts on jobs (1.8 jobs for every manufacturing job)

EVOLUTION OF THE WIND TURBINE INDUSTRY

- Industry is above average in R&D/sales
- Emergence of a dominant design (3 blade, windside of tower, generator/power converter configuration)
- Shift from product innovation to process innovation is starting to happen
- Customers are getting larger and more sophisticated and will increase demands on turbine manufacturers for price, service, warranties
- Increasing number of frame agreements for buying components and selling turbines will increase certainty of component sourcing and reliability of sales projections
- Service revenue from operation and maintenance may soon equal or exceed revenue from turbine sales

Thank you.

Questions?