

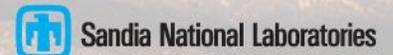
Wind Industry Status

Daniel Laird

Wind & Water Power Technologies
Sandia National Laboratories
E-mail@sandia.gov
(505) 844-6188



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.



Our Business: National Security

- Broad mission in developing science and technology applications to meet our rapidly changing, complex national security challenges
- Safety, security and reliability of our nation's nuclear weapon stockpile



Sandia
VISION

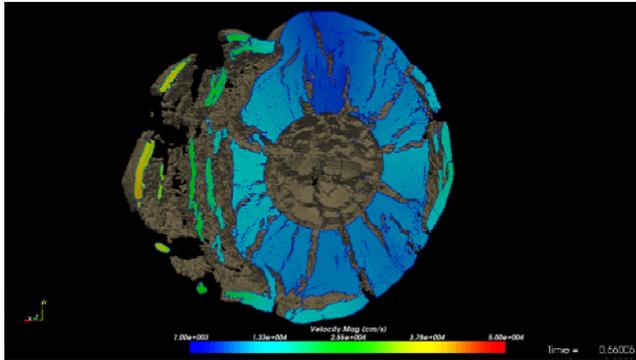
helping our nation secure a peaceful and free world through technology

- ★ Integrity
- ★ Excellence
- ★ Service to the Nation
- ★ Each Other
- ★ Teamwork

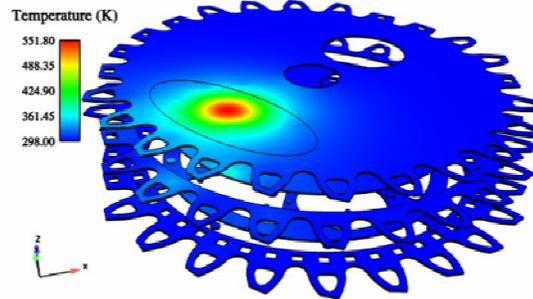
Our highest goal is to become the laboratory that the U.S. turns to first for technology solutions to the most challenging problems that threaten peace and freedom for our nation and the globe.



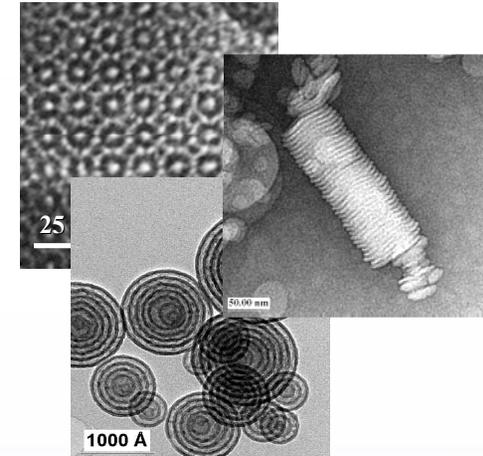
Strong Science and Engineering



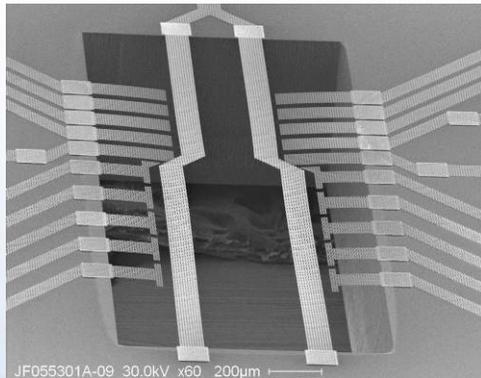
Computational and Information sciences



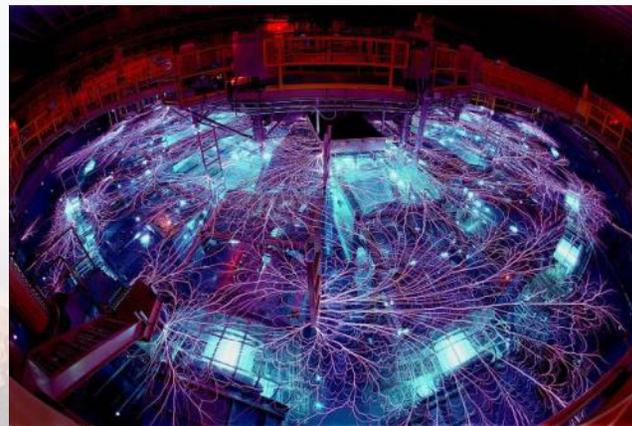
Engineering Sciences



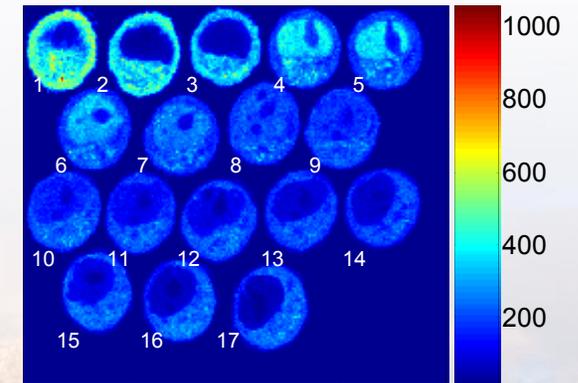
Materials Science and Technology



Microelectronics and Photonics



Pulsed Power



Bioscience



Sandia National Laboratories



**Albuquerque,
New Mexico**



**Kauai Test Facility,
Hawaii**



**Tonopah Test Range,
Nevada**



**Yucca Mountain,
Nevada**



WIPP, New Mexico



Pantex, Texas

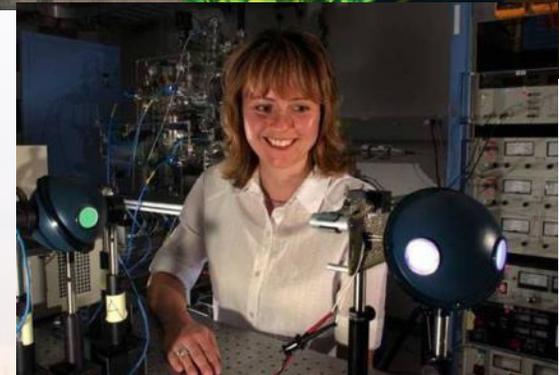
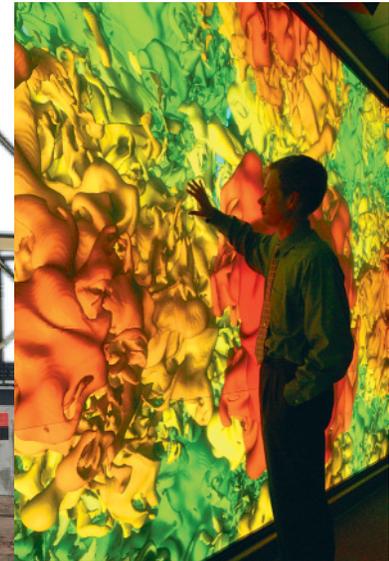
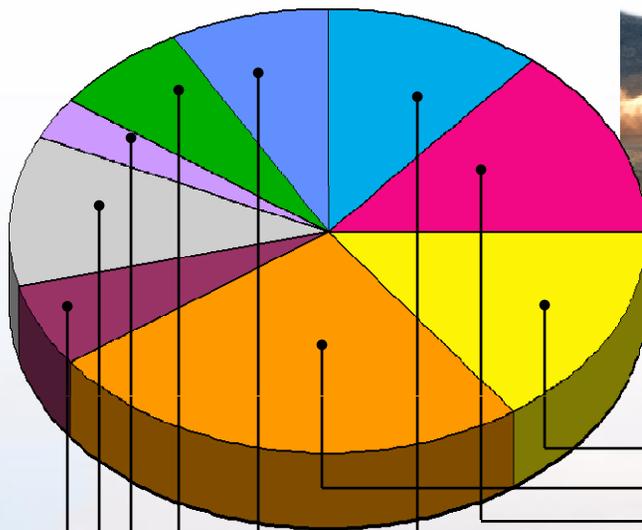


Livermore, California



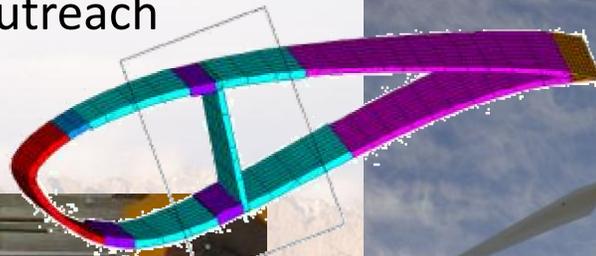
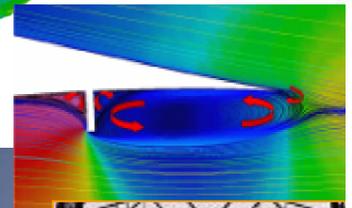
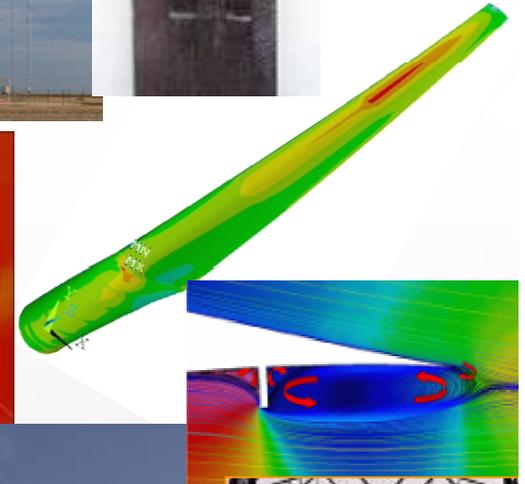
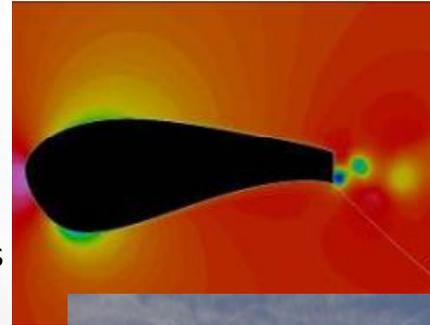
Highly Skilled Workforce

- More than 11,400 on-site workforce
- More than 1,500 PhDs and 2,700 MS/MAs
- \$2.2 billion FY09 total budget



Wind Energy Research at SNL

- Began in the mid 1970's – VAWT focus
- Early 1990's shift to HAWT research
- Current research
 - Turbine Technology
 - Materials and Manufacturing
 - Structural, Aerodynamic, and Full System Modeling
 - Sensors and Structural Health Monitoring
 - Advanced Blade Concepts
 - Lab - Field Testing and Data Acquisition
 - System Reliability
 - Industry Data Collection
 - Improve reliability of current and future designs
 - Blade Reliability Collaborative
 - System Integration & Outreach
 - Wind/RADAR Interaction
 - Integration Assessment
 - SNL Wind Farm Feasibility



Installed Capacity

World

Year:	Installed MW	Increase %	Cumulative MW	Increase %
2004	8,154		47,912	
2005	11,542	42%	59,399	24%
2006	15,016	30%	74,306	25%
2007	19,791	32%	94,005	27%
2008	28,190	42%	122,158	30%
2009	38,103	35%	160,084	31%
Average growth - 5 years		36.1%		27.3%

Source: BTM Consult ApS - March 2010



The 10 Largest Markets in 2009

Country	2007	2008	2009	Share %	Cum. Share %
P.R. China	3,287	6,246	13,750	36.1%	36%
USA	5,244	8,358	9,922	26.0%	62%
Spain	3,100	1,739	2,331	6.1%	68%
Germany	1,667	1,665	1,917	5.0%	73%
India	1,617	1,810	1,172	3.1%	76%
Italy	603	1,010	1,114	2.9%	79%
France	888	1,200	1,104	2.9%	82%
UK	427	869	1,077	2.8%	85%
Canada	386	526	950	2.5%	87%
Portugal	434	679	645	1.7%	89%
Total	17,653	24,102	33,982		
Percent of World	89.2%	85.5%	89.2%		

Source: BTM Consult ApS - March 2010



The 10 Largest Markets by end of 2009

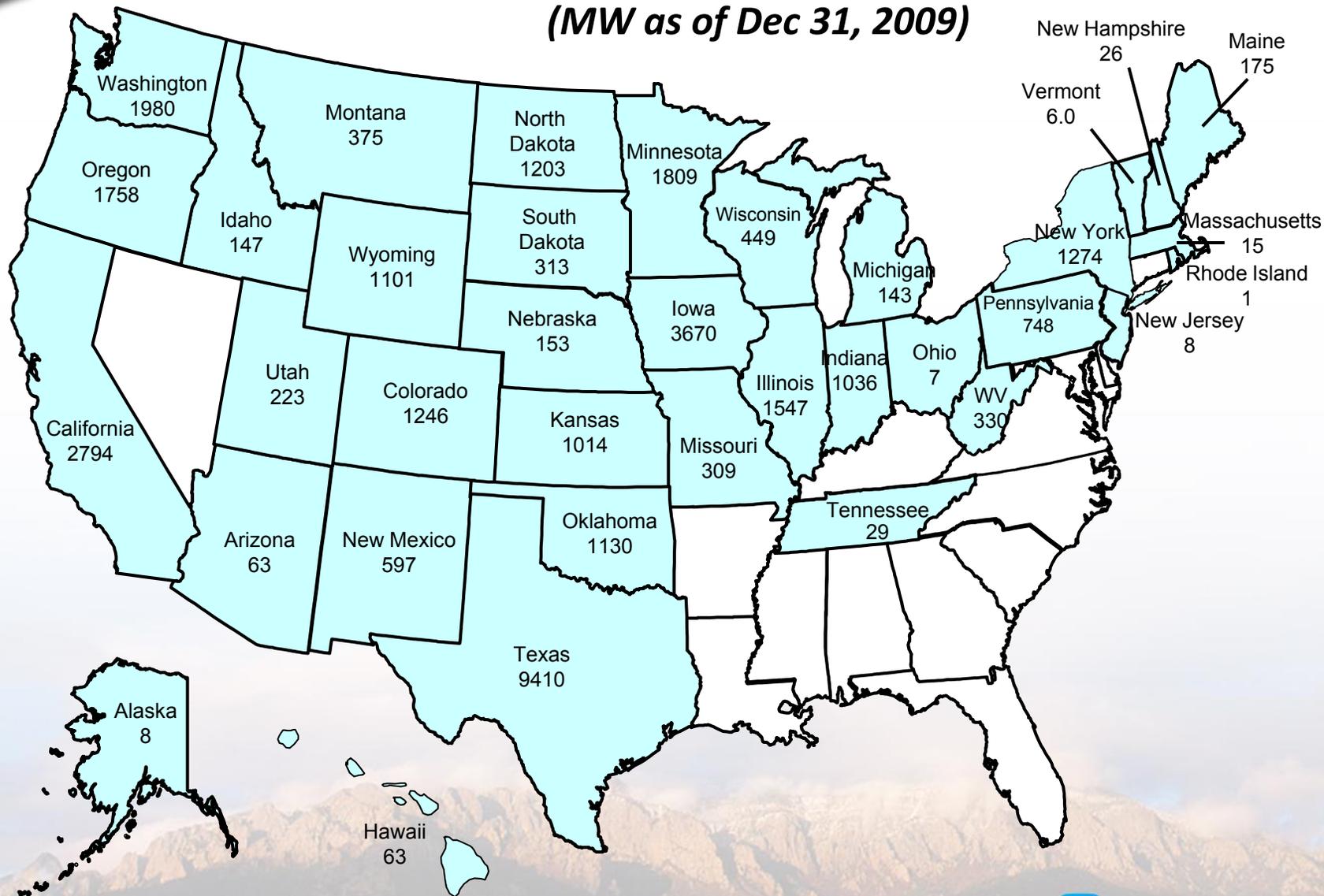
Country	2007	2008	2009	Share %	Cum. Share %
USA	16,879	25,237	35,159	22.0%	22%
P.R. China	5,875	12,121	25,853	16.1%	38%
Germany	22,277	23,933	25,813	16.1%	54%
Spain	14,714	16,453	18,784	11.7%	66%
India	7,845	9,655	10,827	6.8%	73%
Italy	2,721	3,731	4,845	3.0%	76%
France	2,471	3,671	4,775	3.0%	79%
UK	2,394	3,263	4,340	2.7%	81%
Portugal	2,150	2,829	3,474	2.2%	84%
Denmark	3,088	3,159	3,408	2.1%	86%
Total	80,415	104,051	137,277		
Percent of World	85.5%	85.2%	85.8%		

Source: BTM Consult ApS - March 2010



U.S. Installed Wind Capacity

(MW as of Dec 31, 2009)



source: awea.org

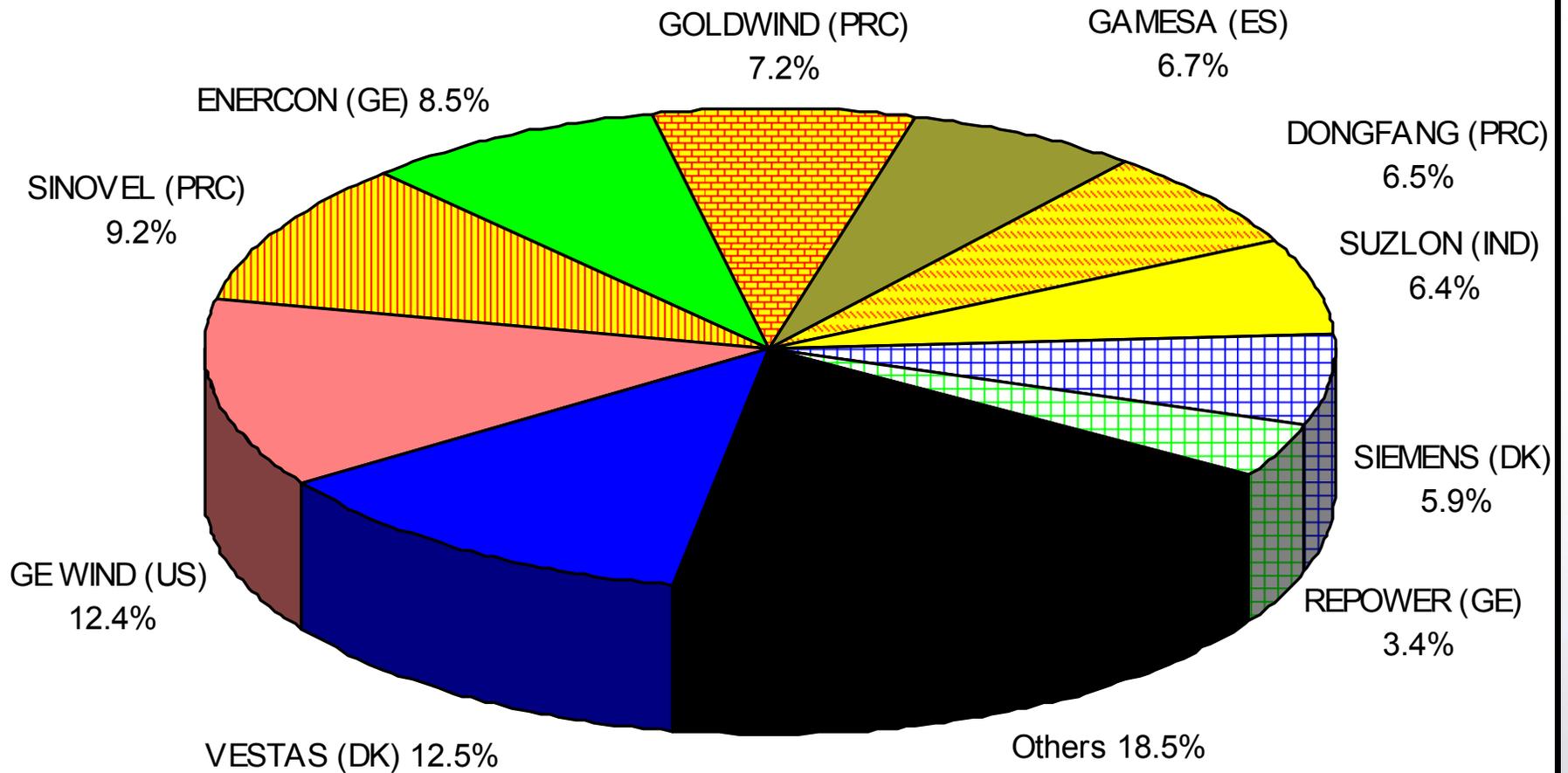
1 MW powers ~300 homes



Sandia National Laboratories

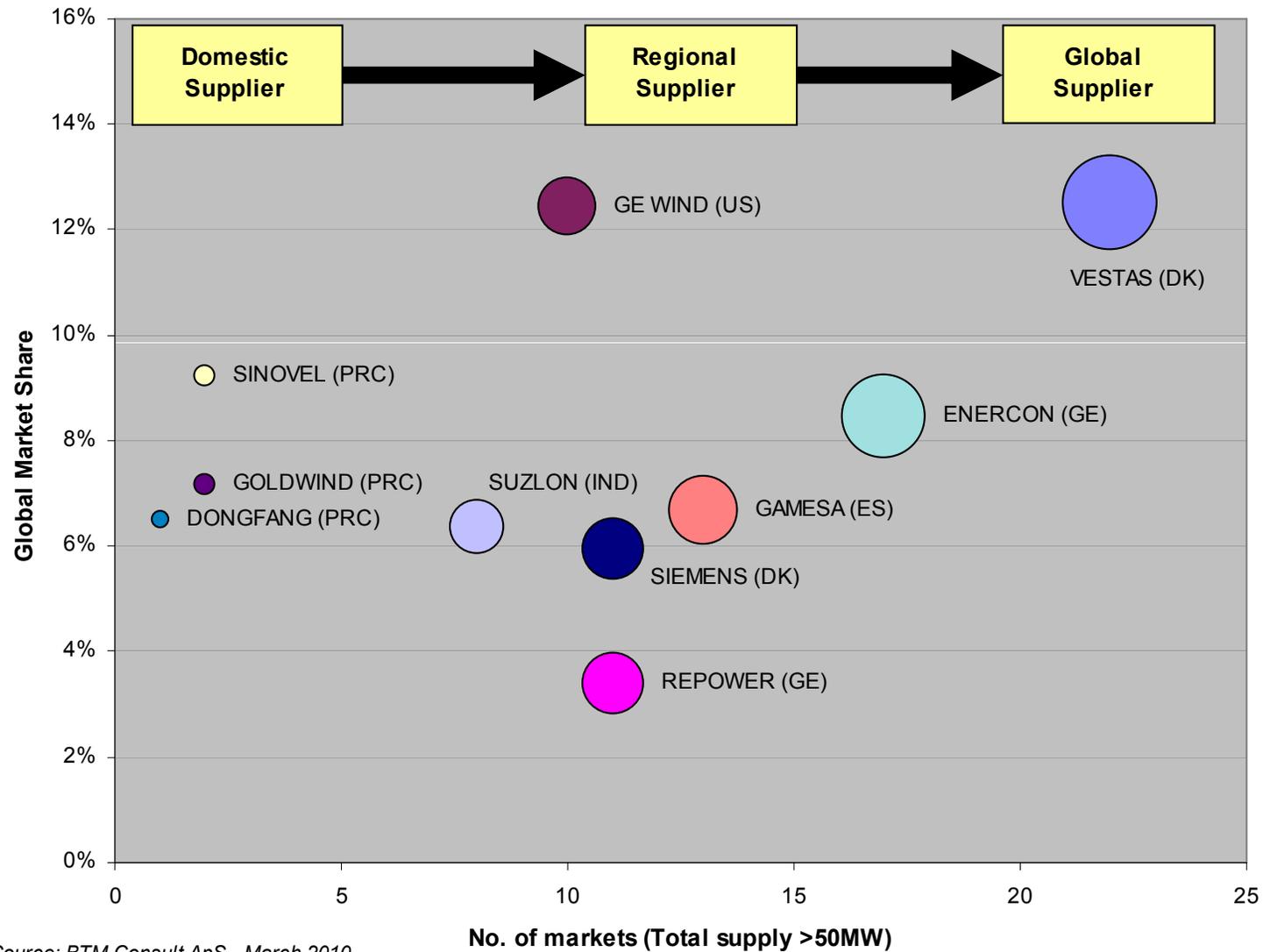
Top-10 Suppliers in 2009

% of the total market 38,103MW



Source: BTM Consult ApS - March 2010

Top-Ten manufacturers' market strength and positions in 2009

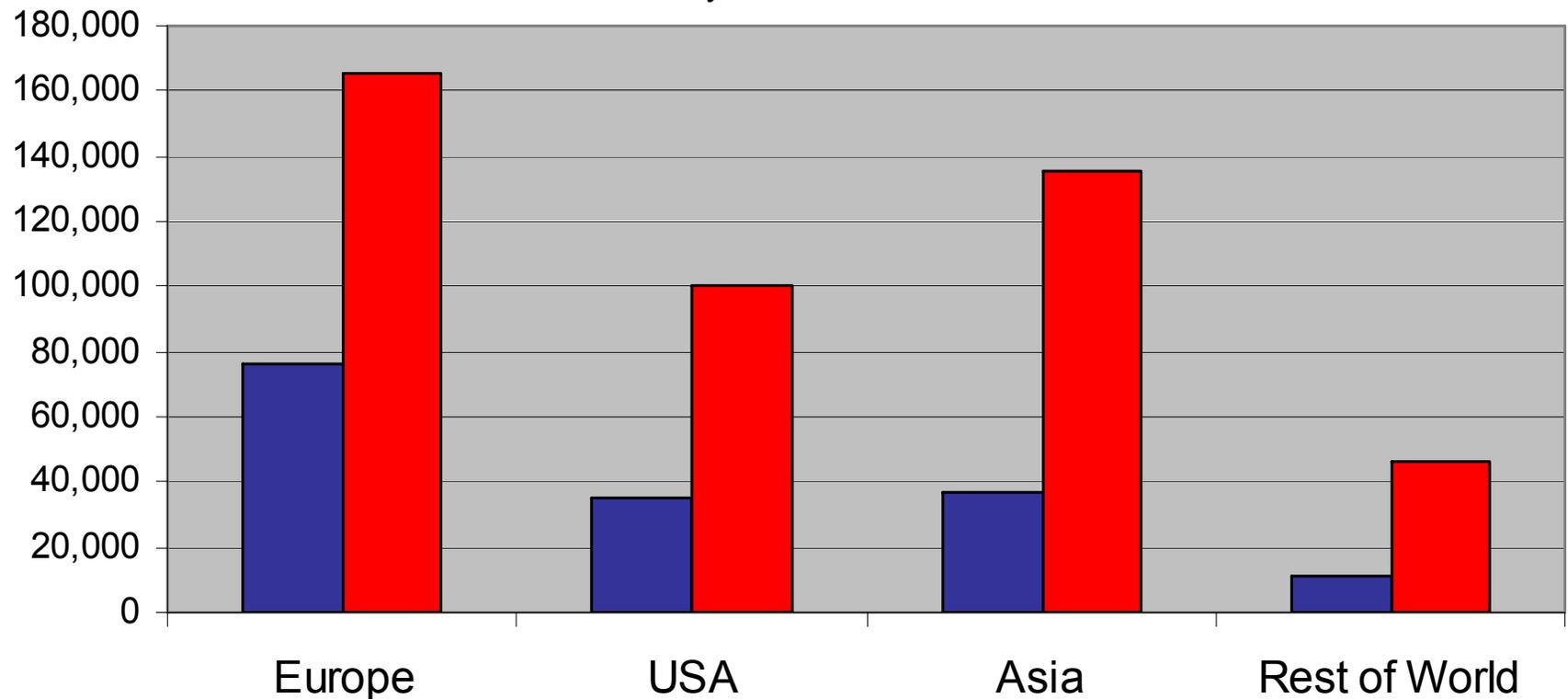


Source: BTM Consult ApS - March 2010



Global Wind Power Forecast

Cumulative MW by end of 2009 & Forecast 2014



Source: BTM Consult ApS - March 2010

■ 2009 (160,084 MW) ■ 2014 (447,689 MW)



Wind Power's Share of World Power Generation

Generation Technology	Electricity gen. by Wind Power (BTM-C) TWh	Electricity from all gen. sources (incl. Wind) IEA TWh	Wind Power's share of the world's electricity generation: %
Year:	TWh	TWh	%
1996	12.23	13,613	0.09%
1997	15.39	13,949	0.11%
1998	21.25	14,340	0.15%
1999	23.18	14,741	0.16%
2000	37.30	15,153	0.25%
2001	50.27	15,577	0.32%
2002	64.81	16,233	0.40%
2003	82.24	16,671	0.49%
2004	96.50	17,408	0.55%
2005	120.72	17,982	0.67%
2006	152.35	18,576	0.82%
2007	194.16	19,756	1.01%
2008	254.13	20,230	1.30%
2009	331.91	20,716	1.60%
2014 (forecast)	941.2	23,324	4.04%
2019 (est.)	2,200.9	26,247	8.39%



Source: BTM Consult ApS - March 2010 ; World Figures: IEA World Energy Outlook 2009

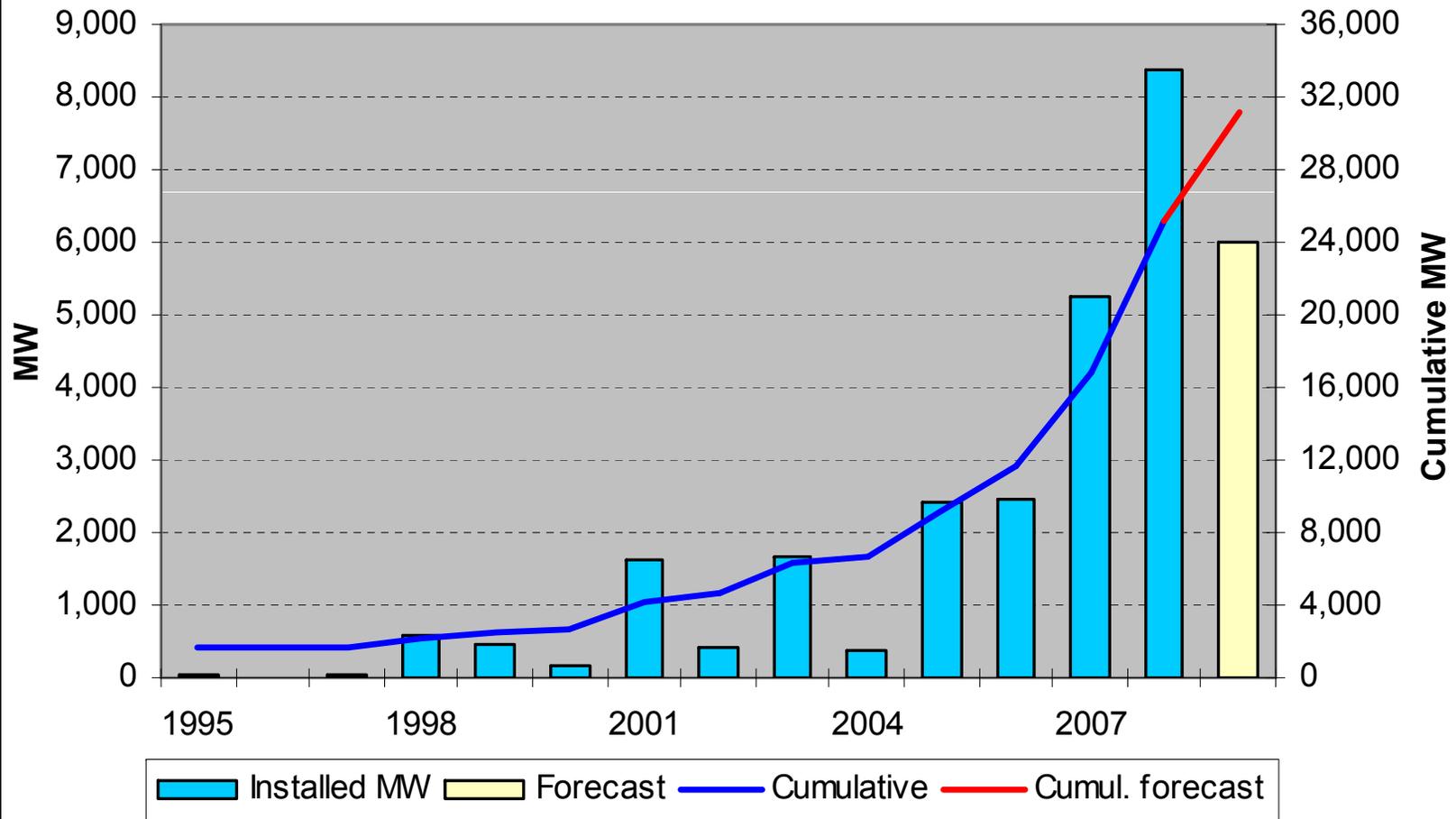


Sandia National Laboratories

U.S. Status (one year ago)

Installed capacity in the USA

Cumulative end 2008: 25,237MW

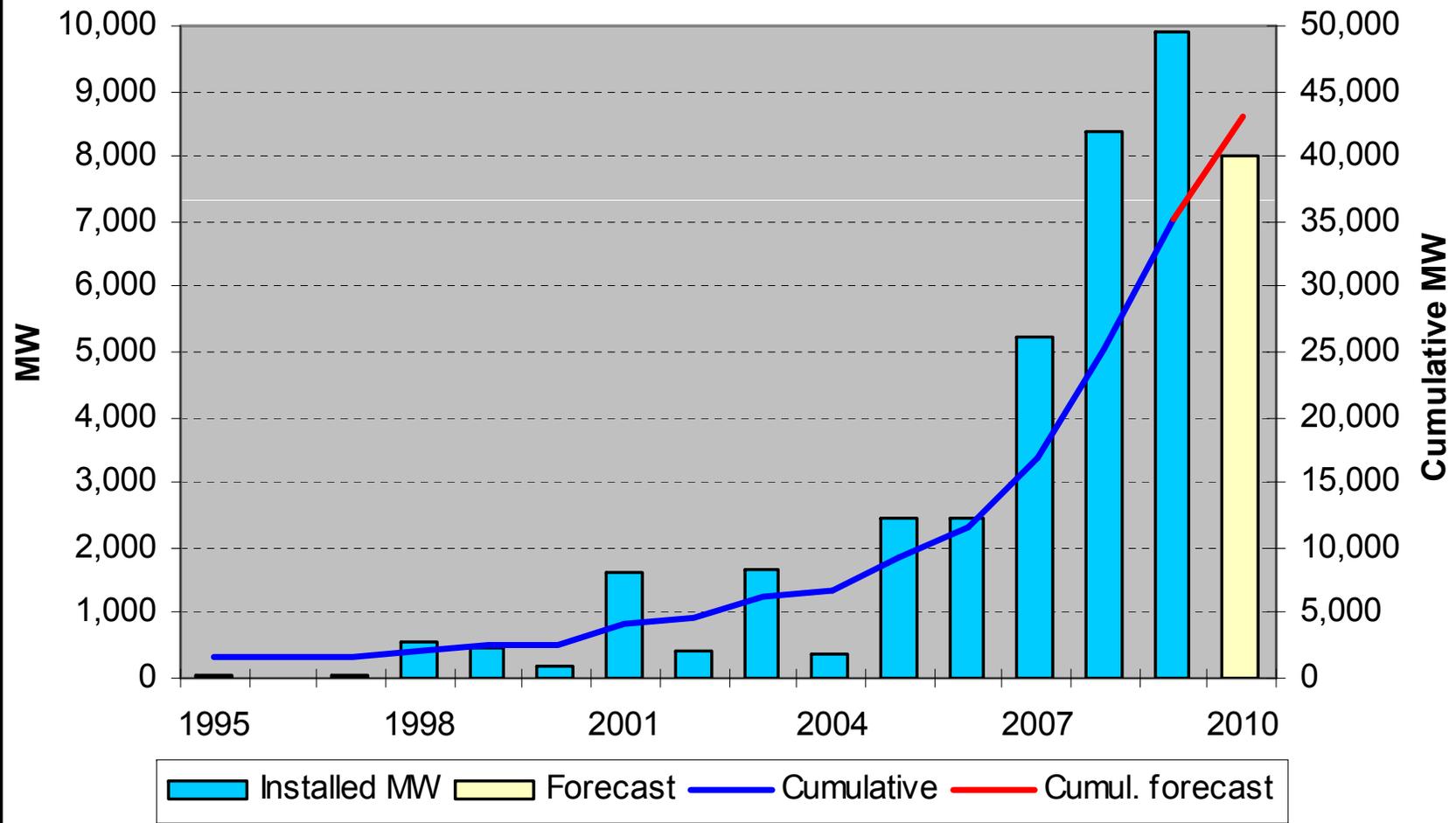


Source: BTM Consult ApS - March 2009

Current U.S. Status

Installed capacity in the USA

Cumulative end 2009: 35,159MW



Source: BTM Consult ApS - March 2010

2010 (U.S.)

Good Year? Bad Year? Slow Start?

■ Favorable legislation

- Renewable Electricity Standard (RES)
- Carbon Tax/Cap
- Stimulus spending

■ Sluggish global economy

- Financing still difficult
- Reduced/stagnant demand

Total U.S. demand (TWh)

2006	4065
2007	4157
2008	4117
2009	3953

U.S. Wind Installations (MW)

2009 Q4	4041
2010 Q1	539

