AWEA AMERICAN WIND ENERGY ASSOCIATION

U.S. Wind Industry: On the Move

Denise Bode

Chief Executive Officer

American Wind Energy Association

Market Update

U.S. is World Leader in Wind Power

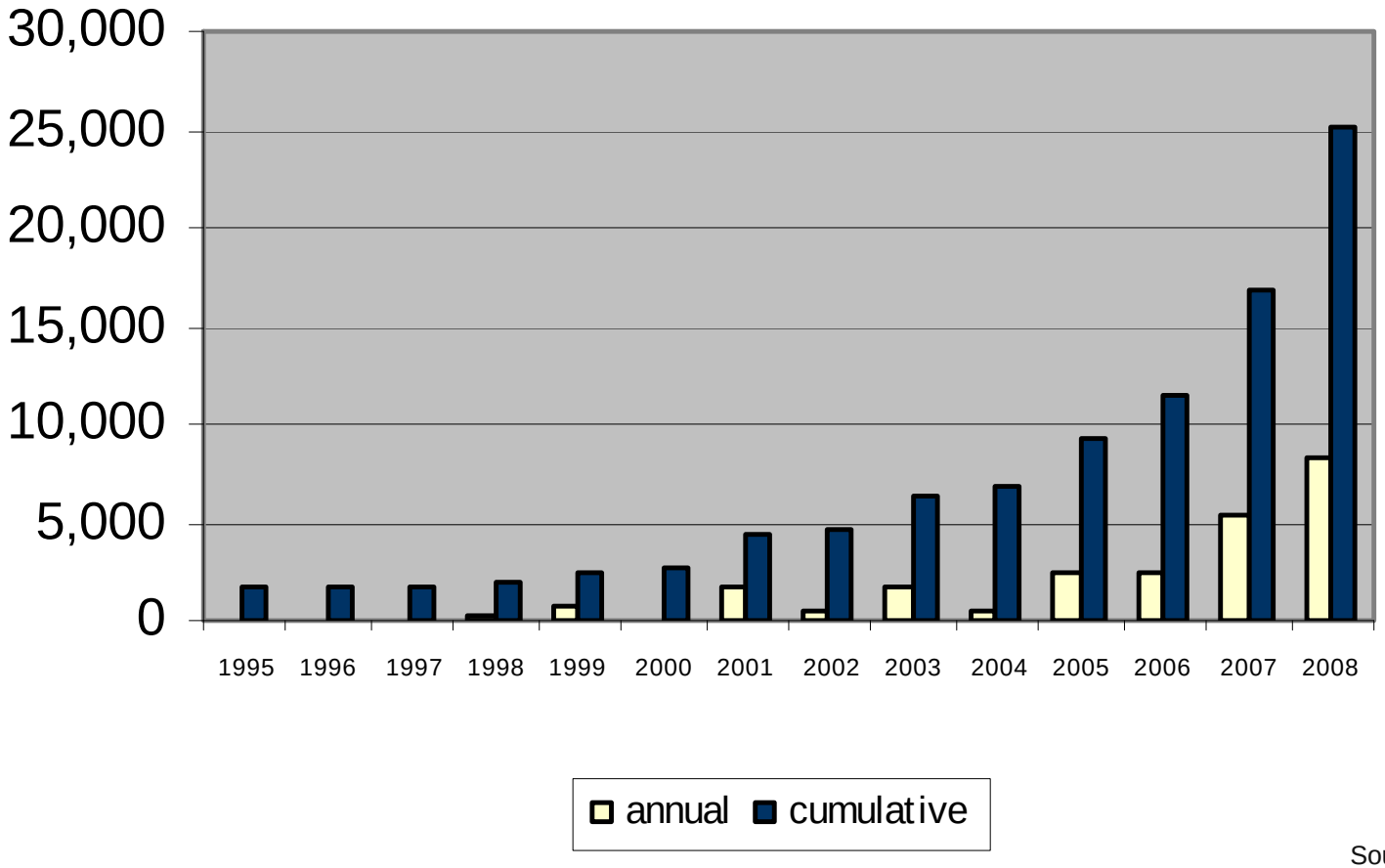
With over 25,000 megawatts, the U.S. is now the #1 wind energy producer in the world.

Global Wind Energy Council,

January 2009

U.S. Wind Power Installations (MW)

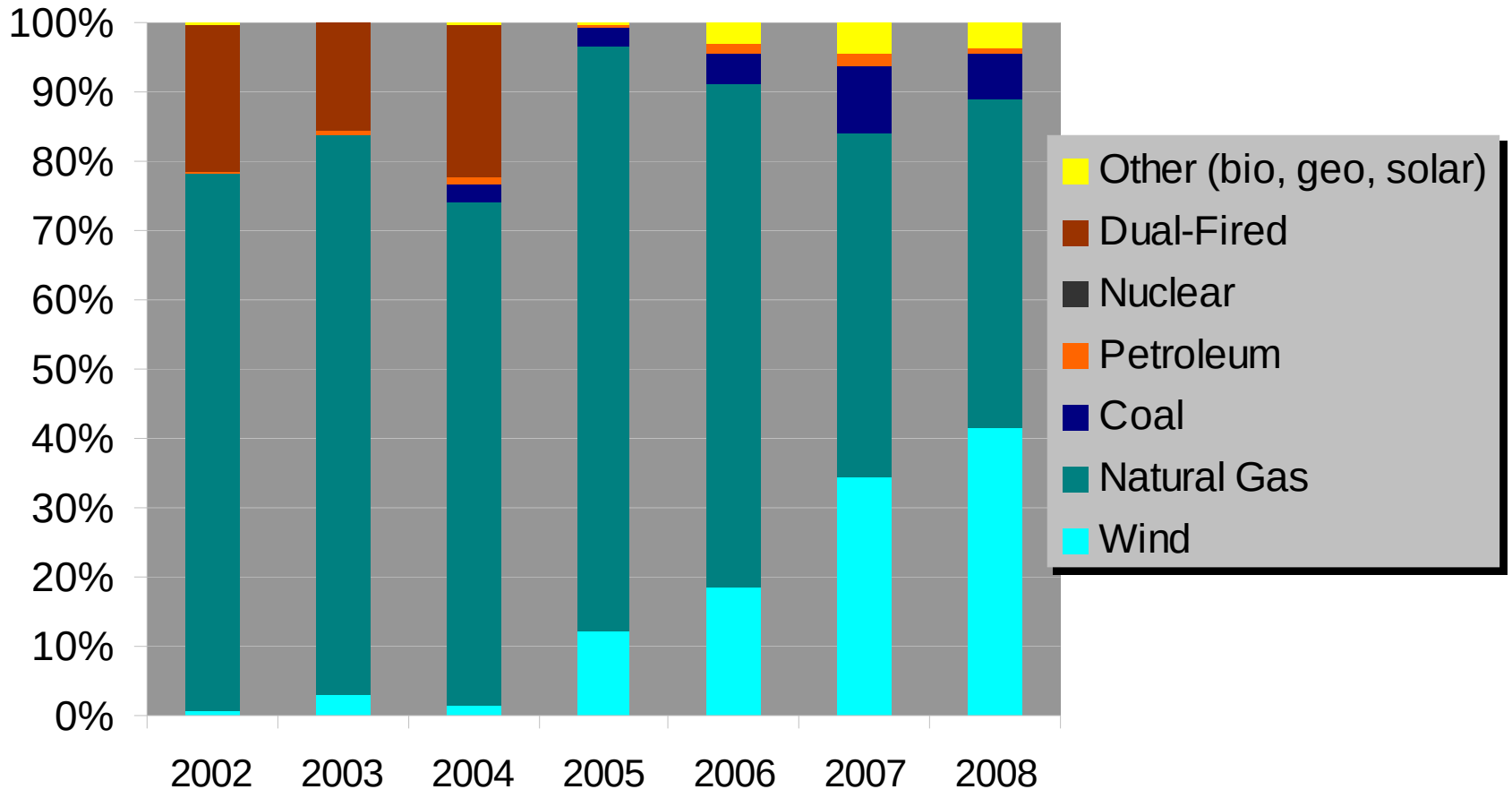
Nearly 8,500 MW installed from 5,000 turbines in 2008



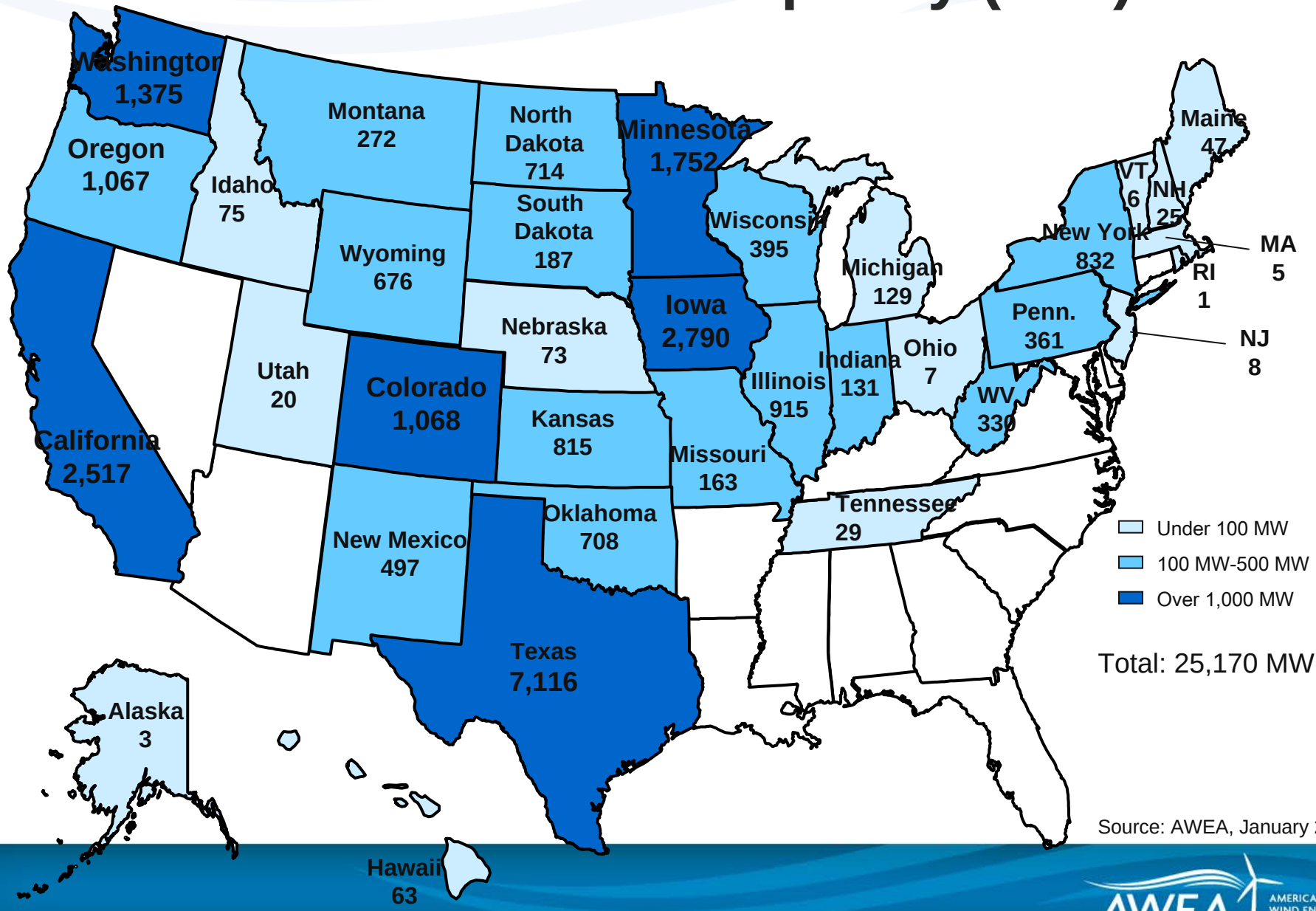
Source: AWEA, January 2009

Wind - One of the Leaders in New Electric Capacity

In 2002, wind was less than 2% of new capacity and is now over 40%



U.S. Wind Power Capacity (MW)

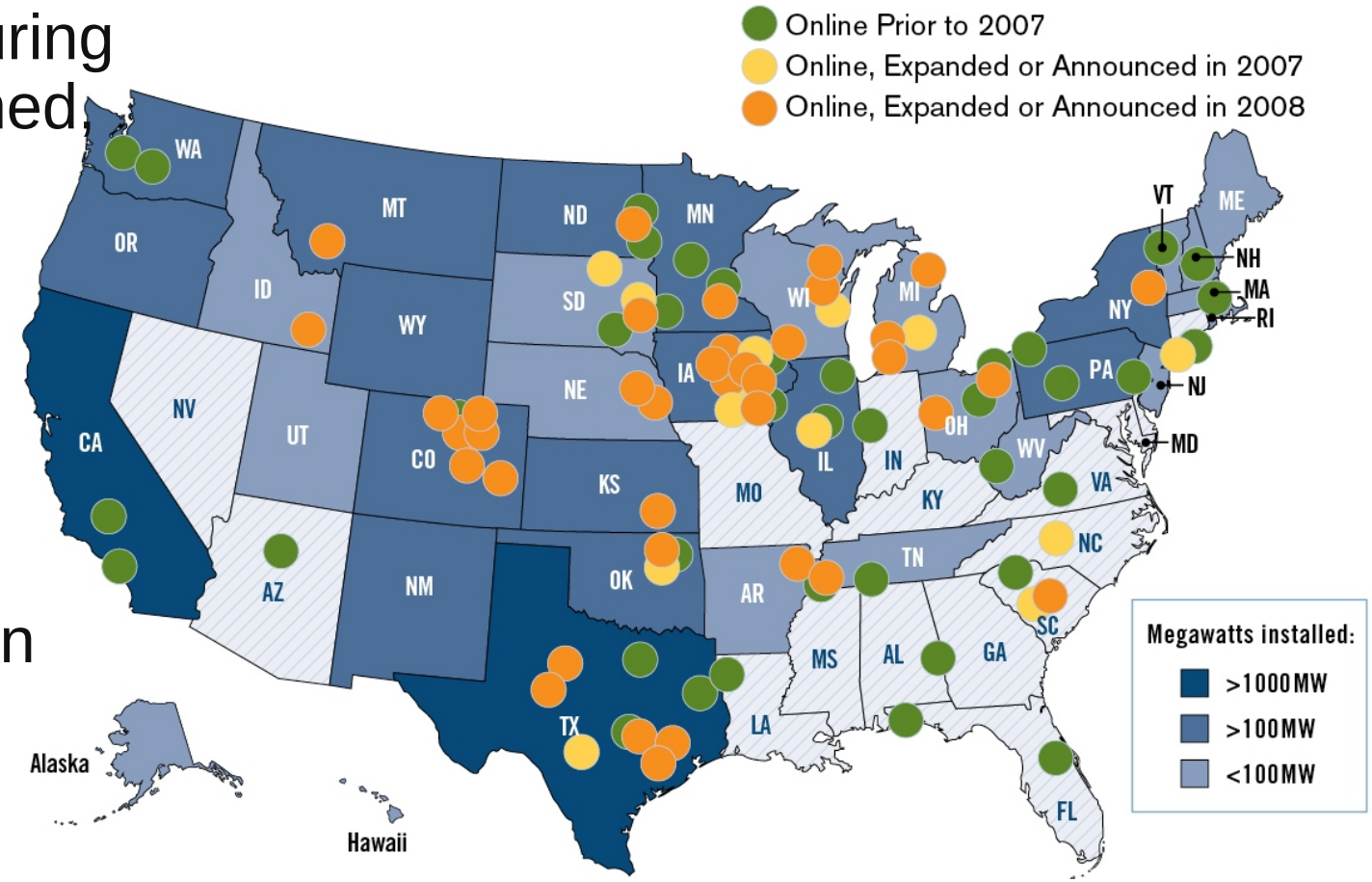


Source: AWEA, January 2009

AWEA AMERICAN WIND ENERGY ASSOCIATION

New Manufacturing

- 55 manufacturing facilities opened expanded or announced in 2008
- 35,000 wind industry jobs created in one year



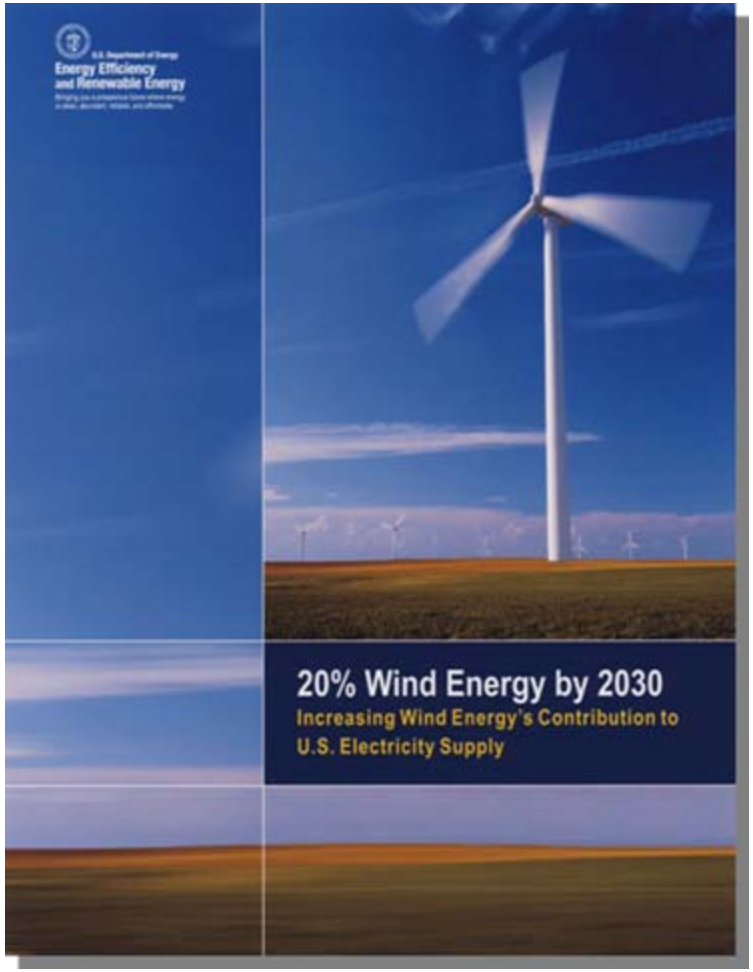
Source: AWEA, Sample of Manufacturing Facilities, November 2008

Growing the Wind Industry

20% Wind Energy by 2030

The U.S. possesses sufficient and affordable wind resources to obtain at least 20% of its electricity from wind by the year 2030.

U.S. Department of Energy, May 2008



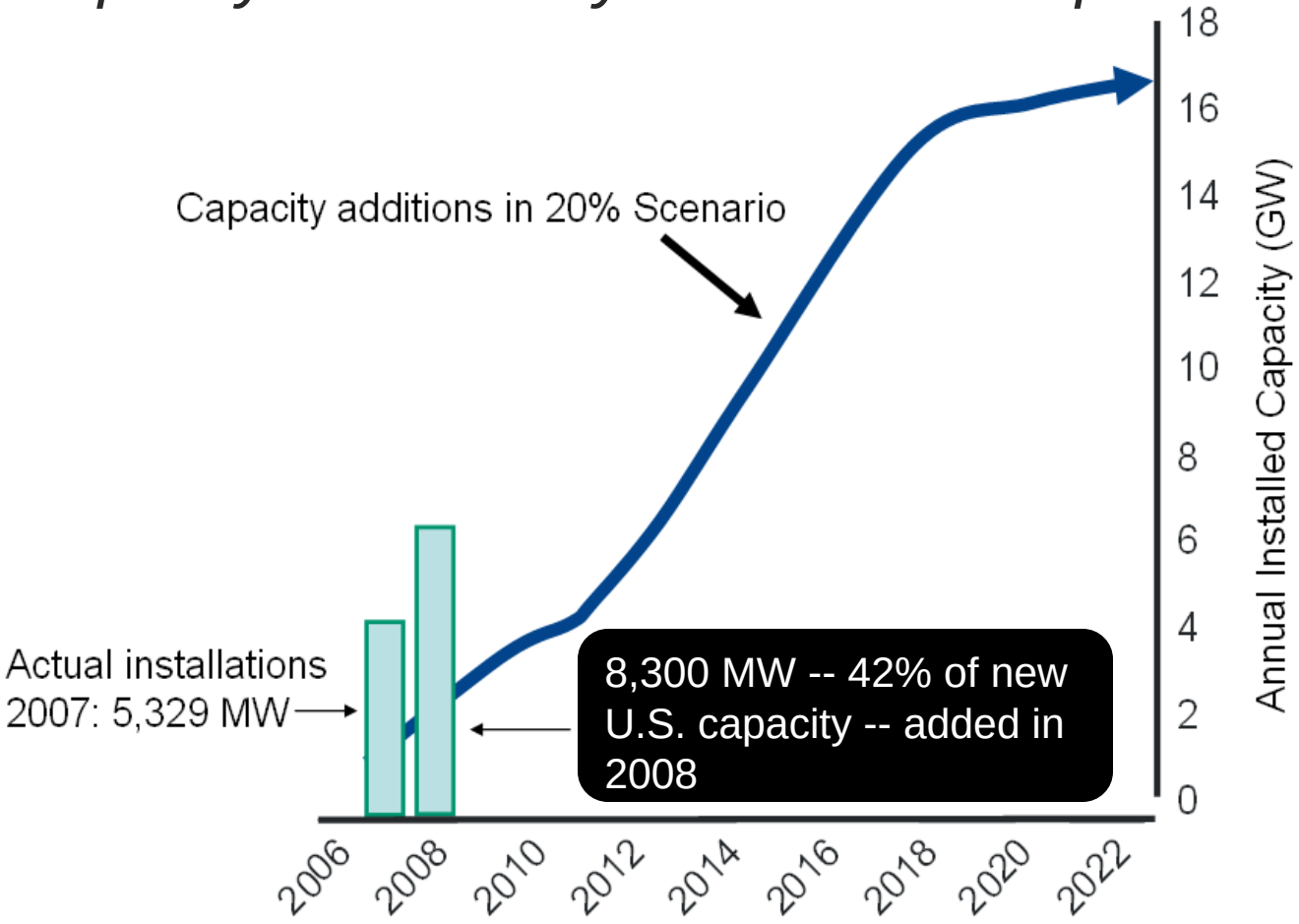
Doubling Renewable Energy in Three Years

- President Obama has called for the U.S. to double its production of renewable energy in 3 years

President Obama gives “thumbs up” to wind energy industry leaders at AWEA member Cardinal Fastener manufacturing facility

Wind Industry Ahead of Curve in Achieving 20% Wind Energy by 2030

Wind capacity has already doubled in the past three years



Legislative Priorities

☑ Immediate Impact:

- Restructure PTC to work in adverse economy

☑ Short-Term Impact:

- Multi-year PTC Extension

☐ Mid-Term Impact:

- National Renewable Electricity Standard (RES)
- Transmission Legislation

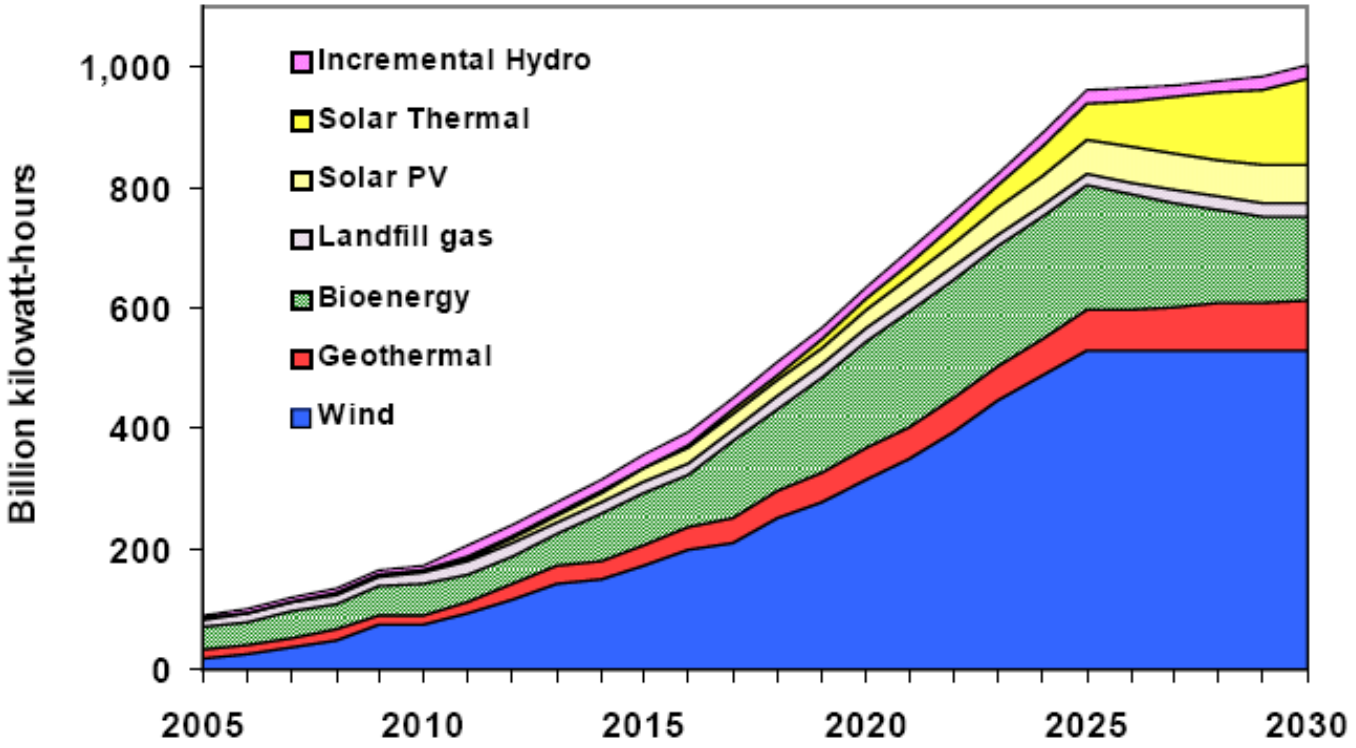
☐ Long-Term Impact:

- Effective Carbon Regulation

www.NewWindAgenda.org

National Renewable Electricity Standard

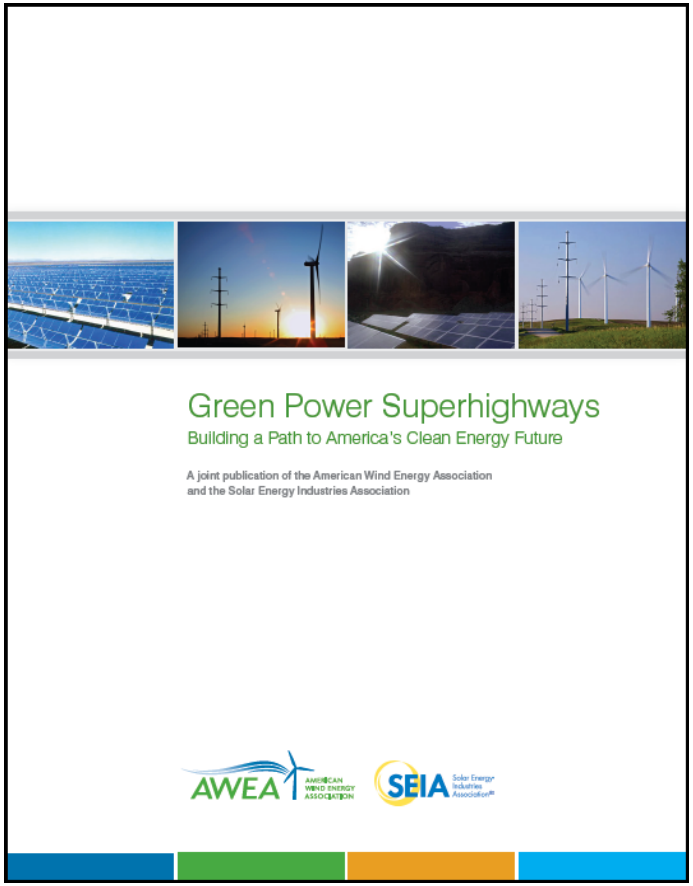
- Seeking a 25% by 2025 RES
- Generation from wind could increase 10-fold compared to today, and meet over 10% of U.S. generation needs
- Wind installations could increase from 25 GW today to 150 GW more by 2025



Source: UCS, 2009

Federal Level Transmission Policies

- Interconnection-Wide Transmission Planning
- Interconnection-Wide Transmission Cost Allocation and Certainty for Cost Recovery
- Federal Siting

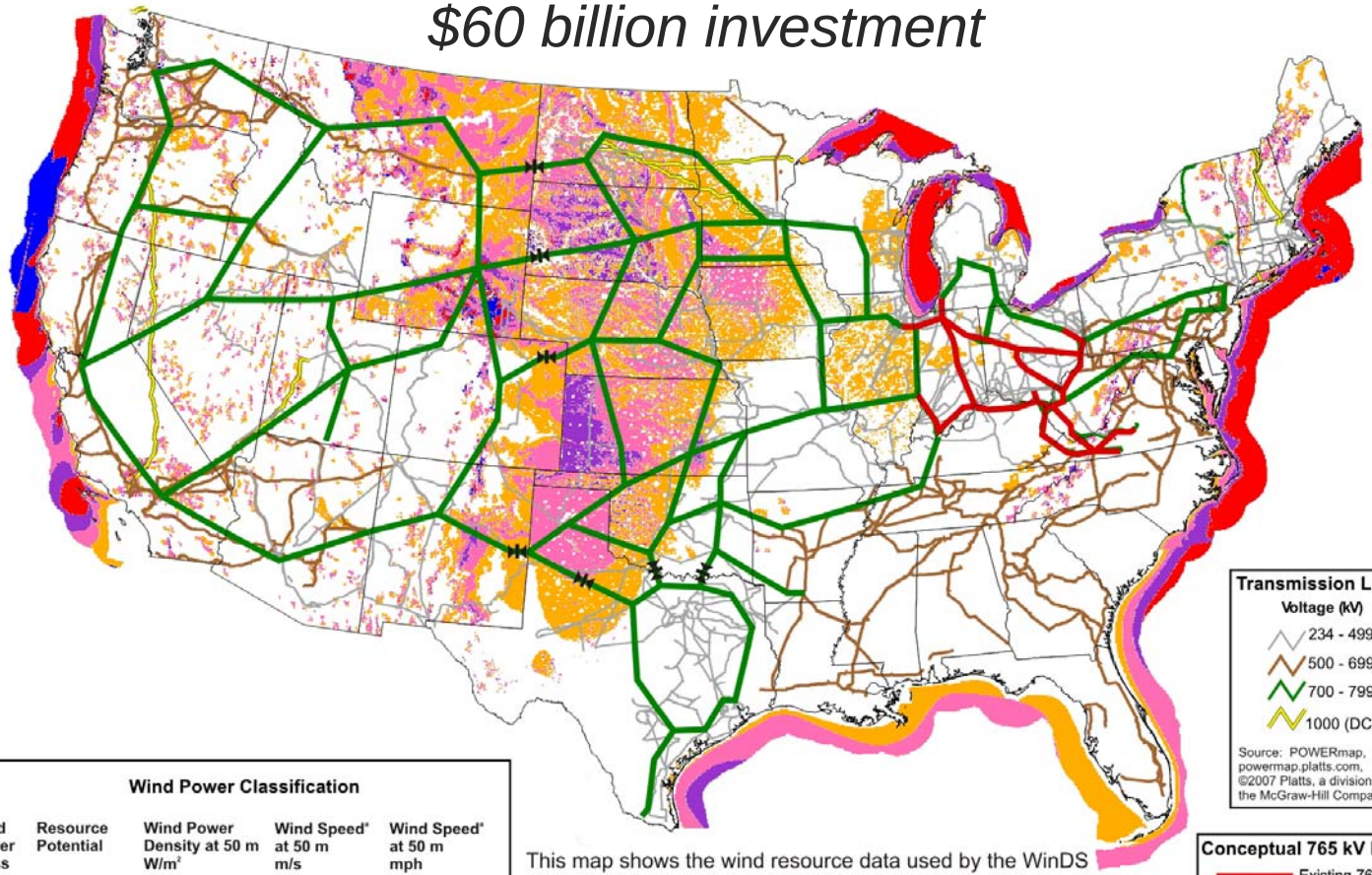


www.awea.org/GreenPowerSuperhighways.pdf

Conceptual Transmission Expansion Plan

Accommodate 400 GW of wind power

$60 billion investment



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m²	Wind Speed* at 50 m m/s	Wind Speed* at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

* Wind speeds are based on a Weibull k value of 2.0

Transmission Lines

Voltage (kV)

- 234 - 499
- 500 - 699
- 700 - 799
- 1000 (DC)

Source: POWERmap, powermap.platts.com, ©2007 Platts, a division of the McGraw-Hill Companies

Conceptual 765 kV Network

- Existing 765 kV
- New 765 kV
- AC-DC-AC Link

Source: American Electric Power (AEP)

This map shows the wind resource data used by the WinDS model for the 20% Wind Scenario. It is a combination of high resolution and low resolution datasets produced by NREL and other organizations. The data was screened to eliminate areas unlikely to be developed onshore due to land use or environmental issues. In many states, the wind resource on this map is visually enhanced to better show the distribution on ridge crests and other features.

National Climate Change Legislation

- A national RES is the first and critical step toward achieving 20% wind power and reaching climate targets as proven in Europe
- National climate policy will get us even closer

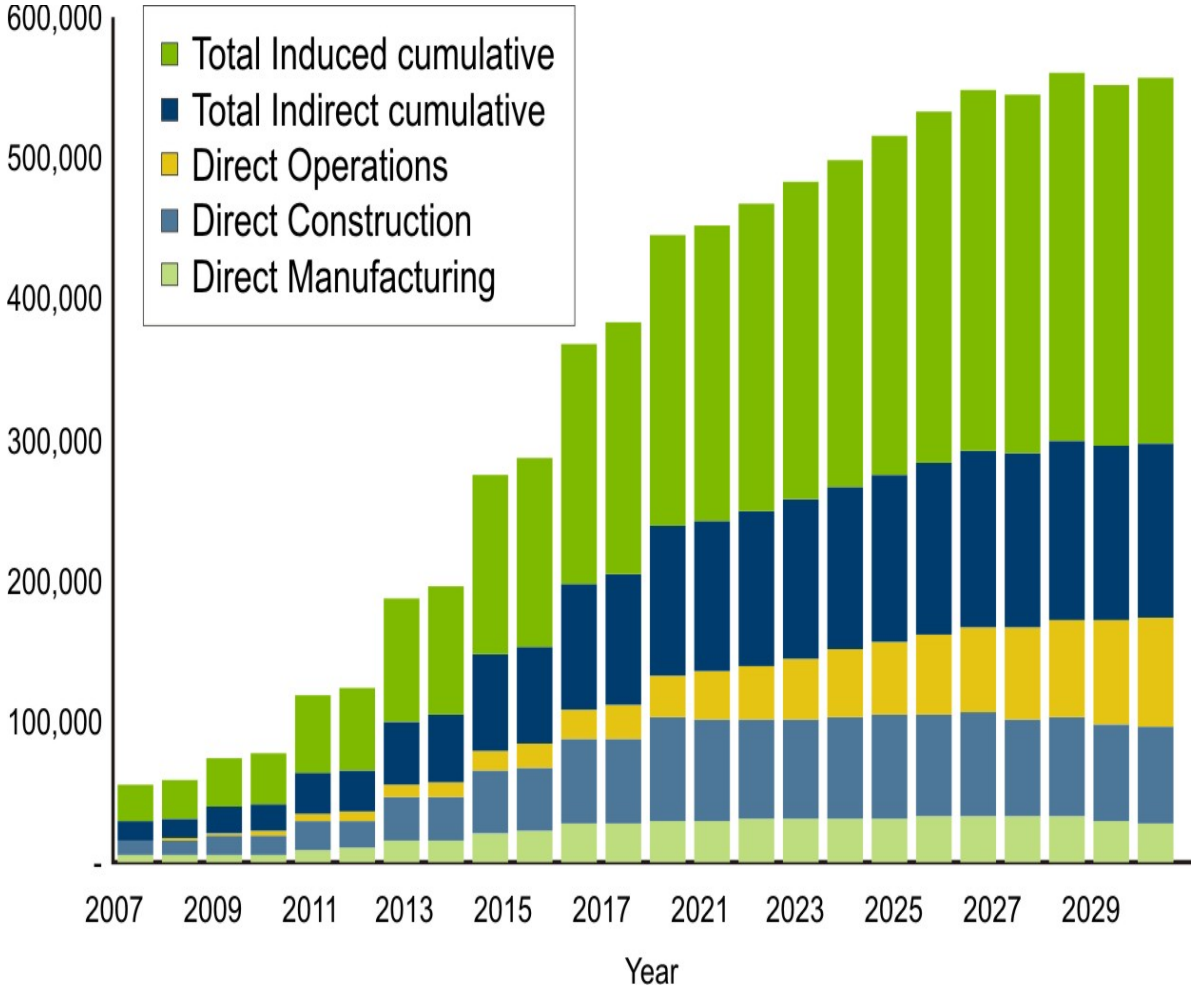
Benefits of Achieving 20% Wind Power

www.NewWindAgenda.org

AWEA AMERICAN WIND ENERGY ASSOCIATION

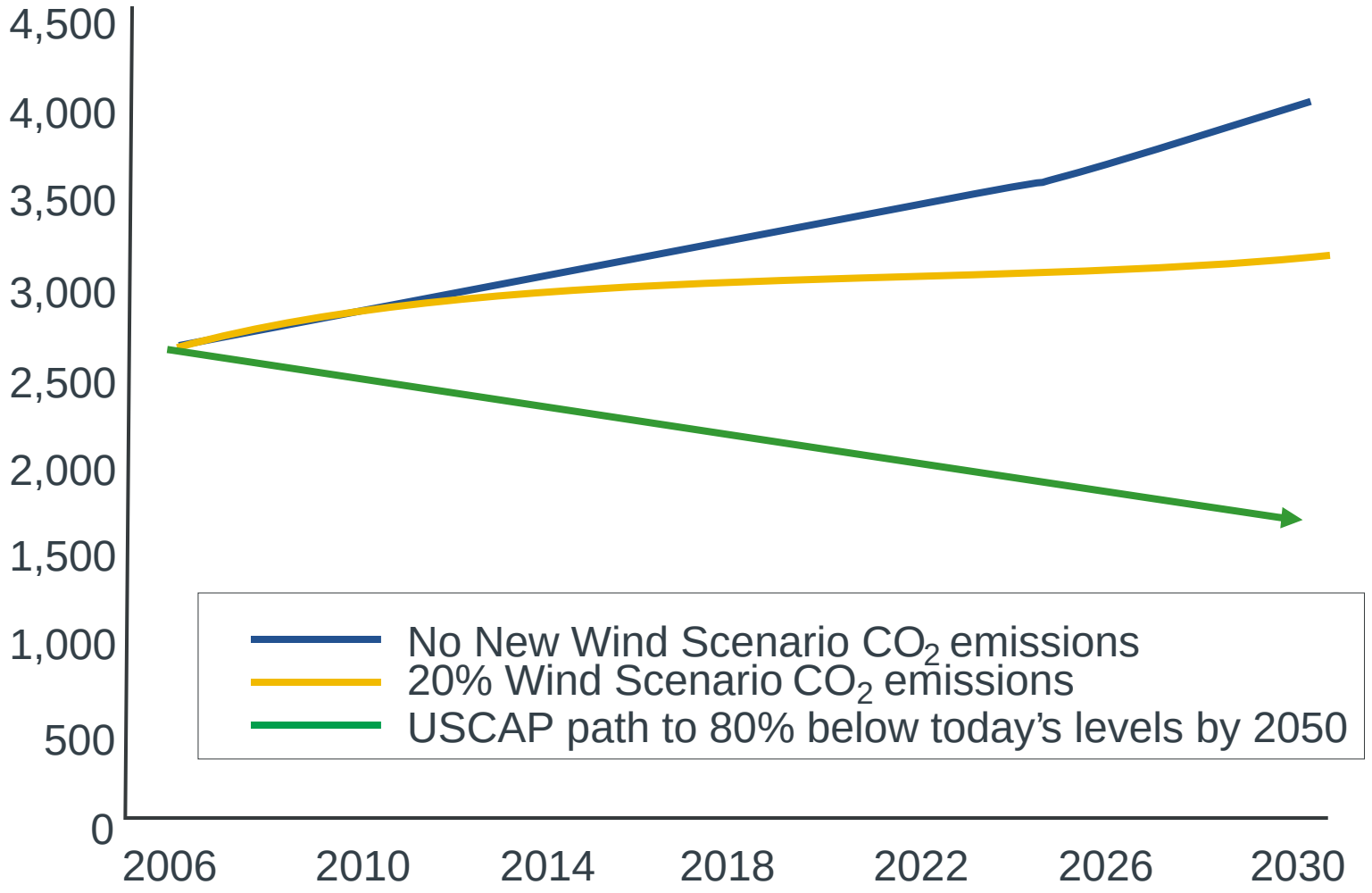
Job Projections Under 20% Report

- Over 500,000 total jobs would be supported by the wind industry
- Wind industry currently employs 85,000 Americans



Source: U.S. DOE, 20% Wind Energy by 2030

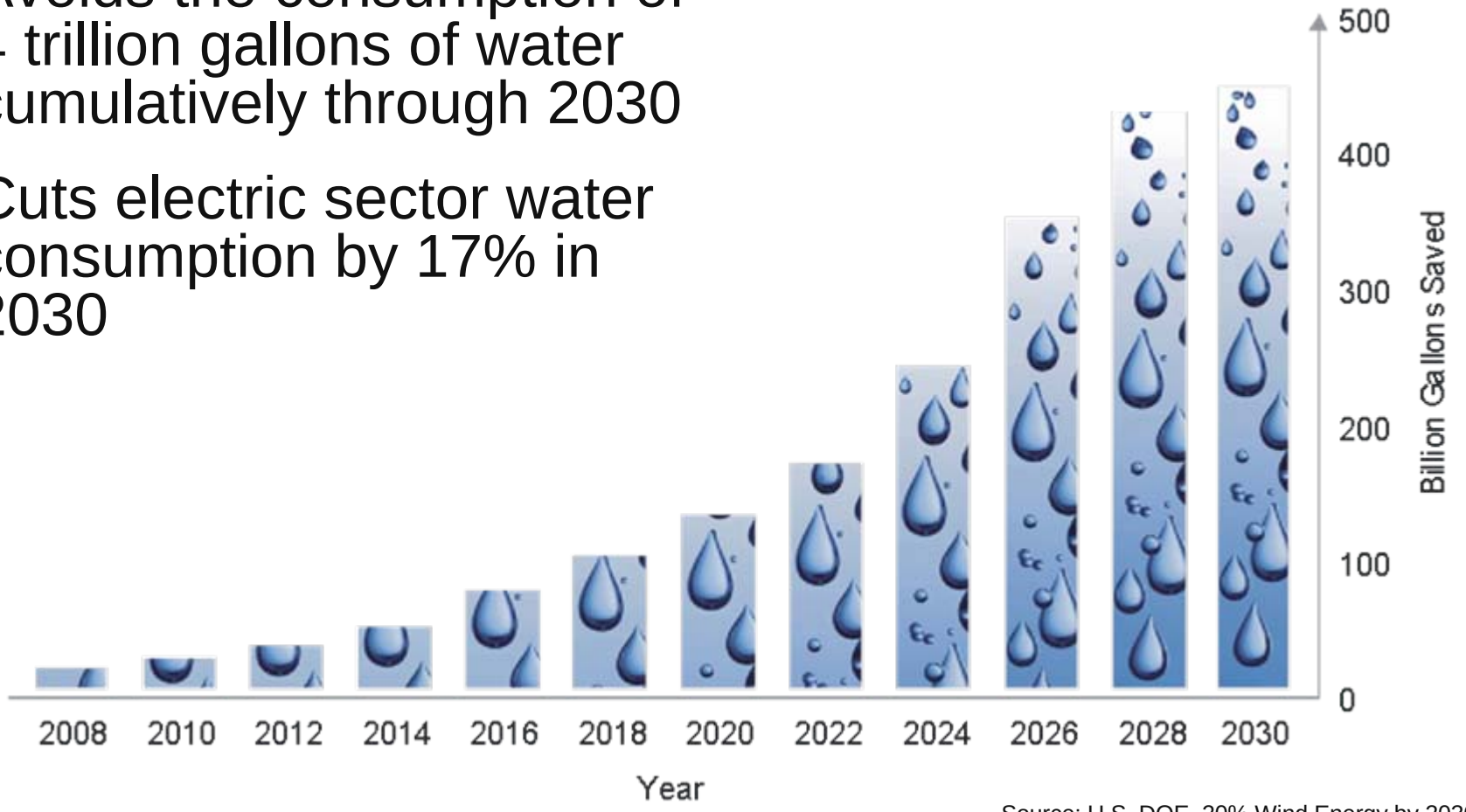
CO_2 Reductions From Electricity Sector



Source: U.S. DOE, 20% Wind Energy by 2030

Significant Water Use Savings

- Avoids the consumption of 4 trillion gallons of water cumulatively through 2030
- Cuts electric sector water consumption by 17% in 2030



Source: U.S. DOE, 20% Wind Energy by 2030

Managing Wind's Variability

- Wind is an energy resource, not a capacity resource
  - 'Reliability' concerns often founded on serious misunderstandings of how grid operates, how wind projects fit into system operations
- Wind power output is 'variable,' not 'intermittent'
  - Wind forecasting plays key role today, will play increasingly important role in future

- There is a cost to managing wind's variability - depends upon system's characteristics, but is generally low
  - Many wind integration studies have been performed in US, EU

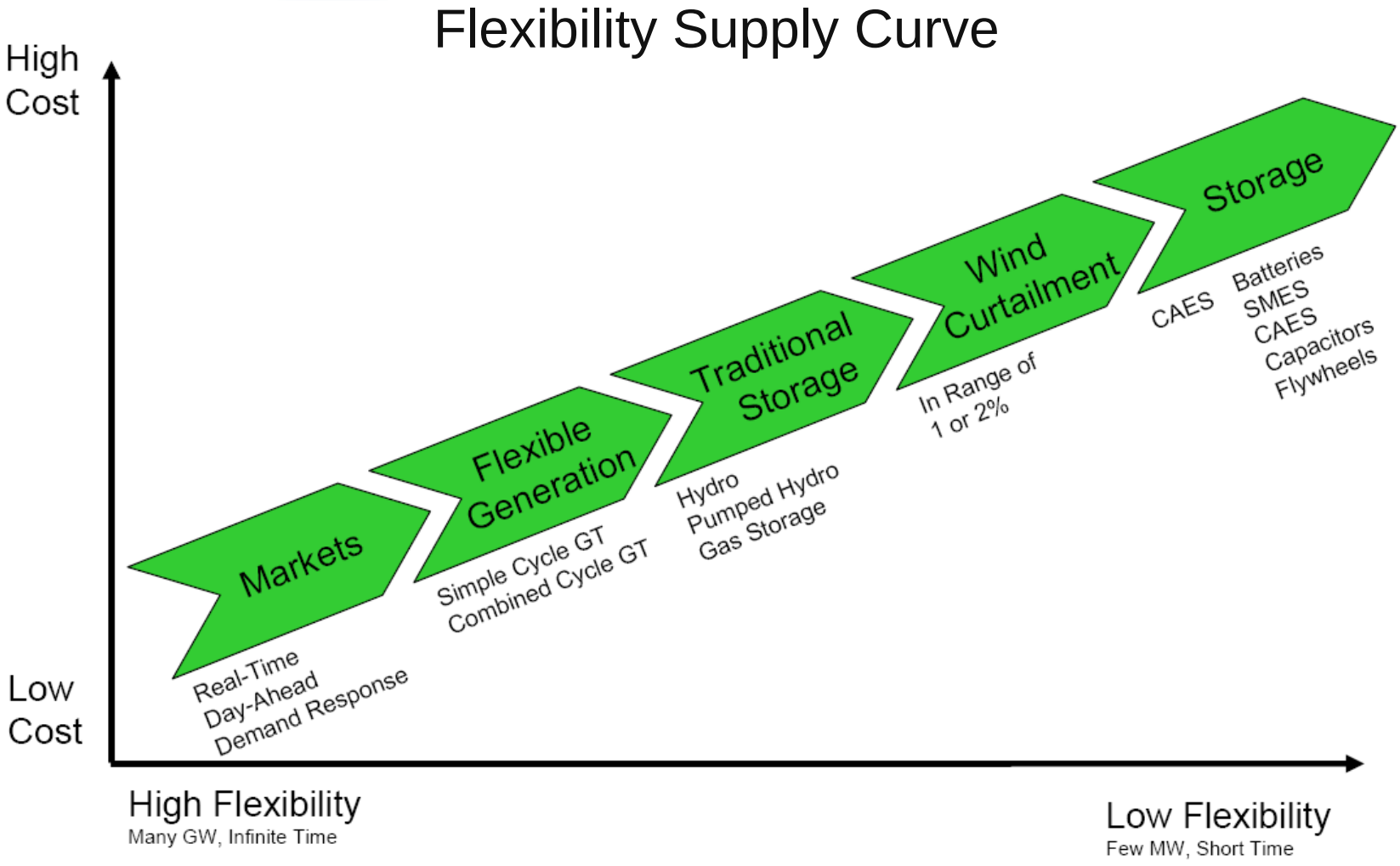
Wind Integration Costs

Date	Study	Wind Capacity Penetration (%)	Regulation Cost ($/MWh)	Load Following Cost ($/MWh)	Unit Commitment Cost ($/MWh)	Gas Supply Cost ($/MWh)	Total Operating Cost Impact ($/MWh)
2002	BPA	7	.19	.28	1.00-1.80	na	1.47-2.27
2003	GRE	16.6	na	na	na	na	4.53
May '03	Xcel-UWIG	3.5	0	0.41	1.44	na	1.85
Sep '04	Xcel-MNDOC	15	0.23	na	4.37	na	4.60
July '04	CA RPS Phase III	4	0.36	na	na	na	na
June '03	We Energies	4	1.12	0.09	0.69	na	1.90
June '03	We Energies	29	1.02	0.15	1.75	na	2.92
2005	PacifiCorp	20	0	1.6	3.0	na	4.6
April '06	Xcel-PSCo	10	0.20	na	2.26	1.26	3.72
April '06	Xcel-PSCo	15	0.20	na	3.32	1.45	4.97

Wind Integration Lessons Learned

- Wind forecasting can significantly reduce integration costs by reducing uncertainty
- Wind resources spread over larger areas are less variable
- Diverse wind has very little variability on the minute-to-minute time scale
- Wind is easier to integrate on more flexible power systems
- Market/system operation reforms, such as control area consolidation, can significantly reduce wind integration costs, as can coordinated regional operations

Accommodating Variability on the Power Grid



Source: U.S. DOE, Wind Dispatchability and Storage

Thank you!

More information about AWEA:

www.awea.org

202-383-2500

windmail@awea.org

The world's largest and most anticipated annual event for wind energy

www.windpowerexpo.org

Appendix

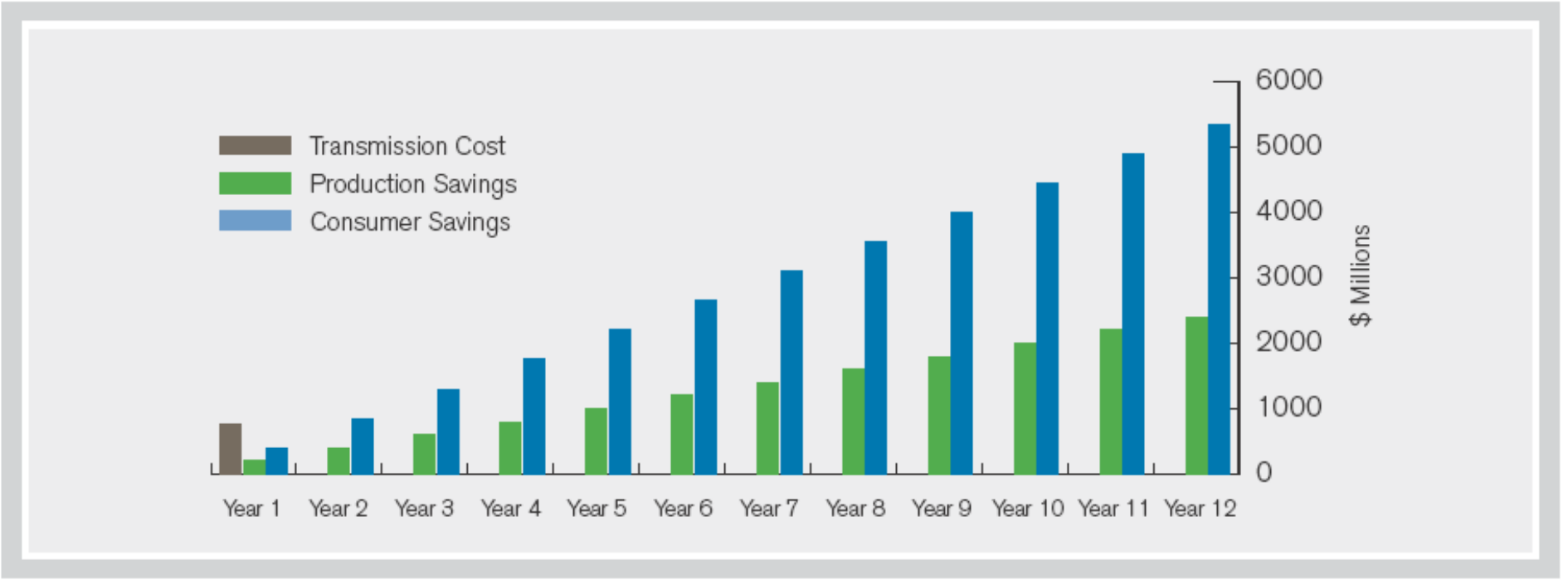
Wind Energy Variability

Because wind energy output adds almost no variability on the minute-to-minute time scale, very large amounts of wind energy can be added to the grid with virtually no impact on the use of spinning reserves.

Study	Wind Amount	1 minute	5 minute	1 hour
Texas 2008	15,000 MW	6.5 MW	30 MW	328 MW
California 2007	12,500 MW (plus 2,600 MW of Solar)	3.3 MW	14.2 MW	129 MW
New York 2005	3,300 MW	- - -	1.8 MW	152 MW

Transmission: A Smart Investment

Results from Texas Study Show that Benefits of Transmission for Wind Exceed Costs



(Source: Electric Reliability Council of Texas)