Wind Development in the US: Current Status and Outlook
美国风能发展概况及展望

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Sino-US Wind Energy Development Seminar

The Regulatory Assistance Project

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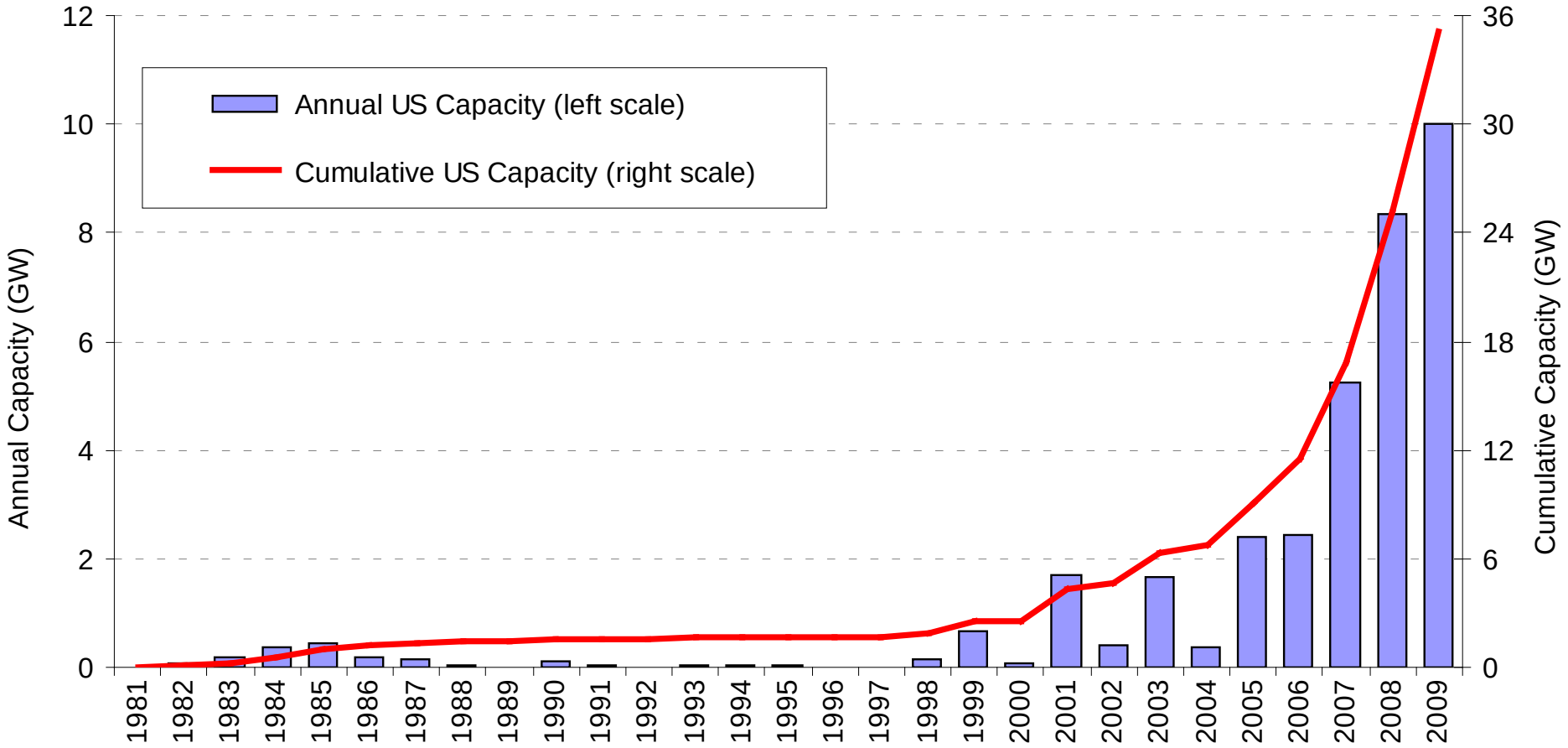
Wind Power in the US at the end of 2009

- U.S. wind industry is growing and maturing at a rapid pace, effectively preparing itself for further growth
- Wind has been competitive in wholesale power markets for much of the 2000s
- Recent trends in the cost and performance of wind projects have led to an escalation in wind prices
- Corresponding drop in wholesale market prices has put increases in sector growth at some risk

Five Years of Strong Growth:

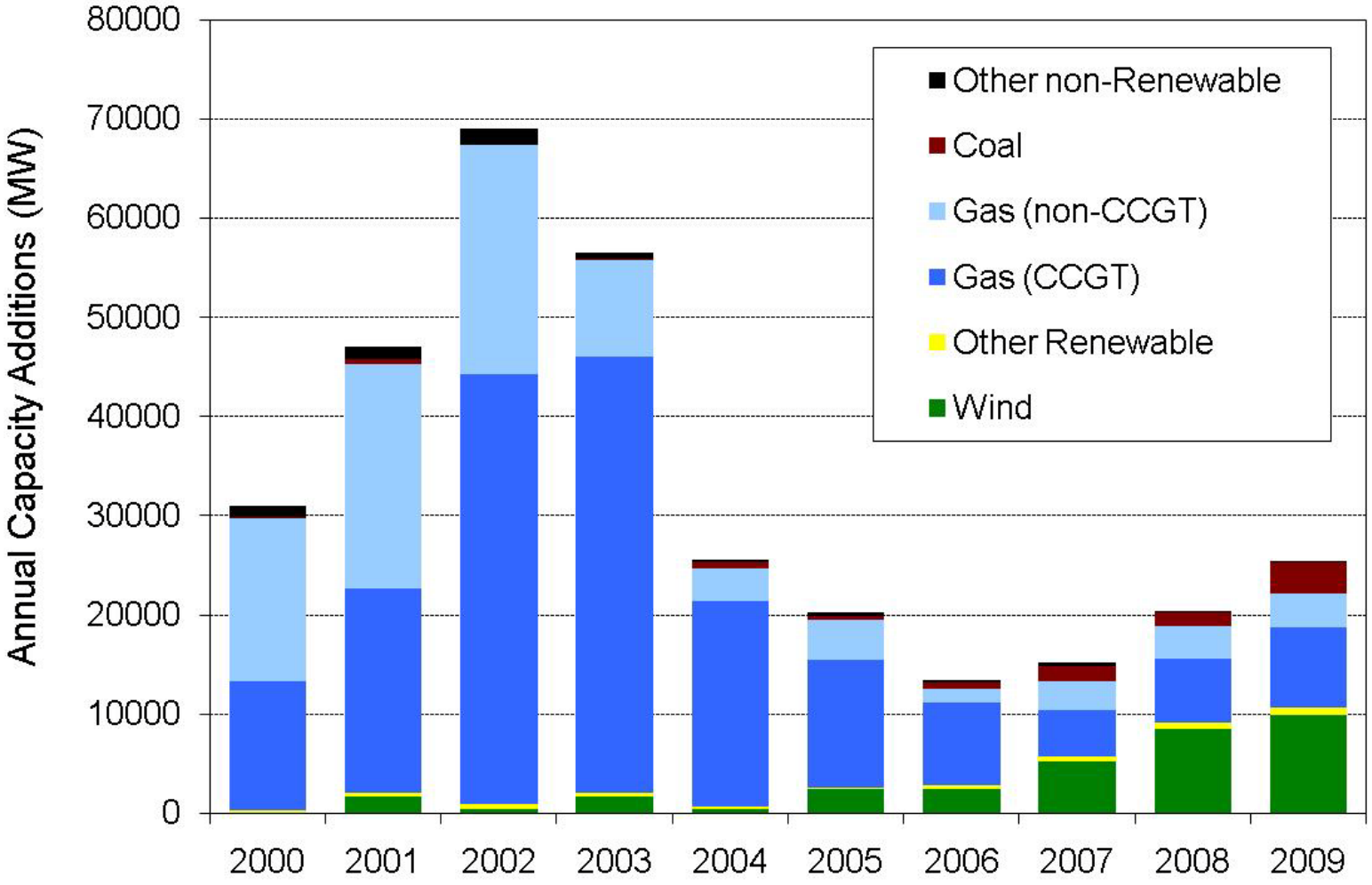
2009: 9,994 MW Added; $21 billion Investment



2nd largest market (behind China) in 2009 capacity additions; largest market in terms of cumulative capacity

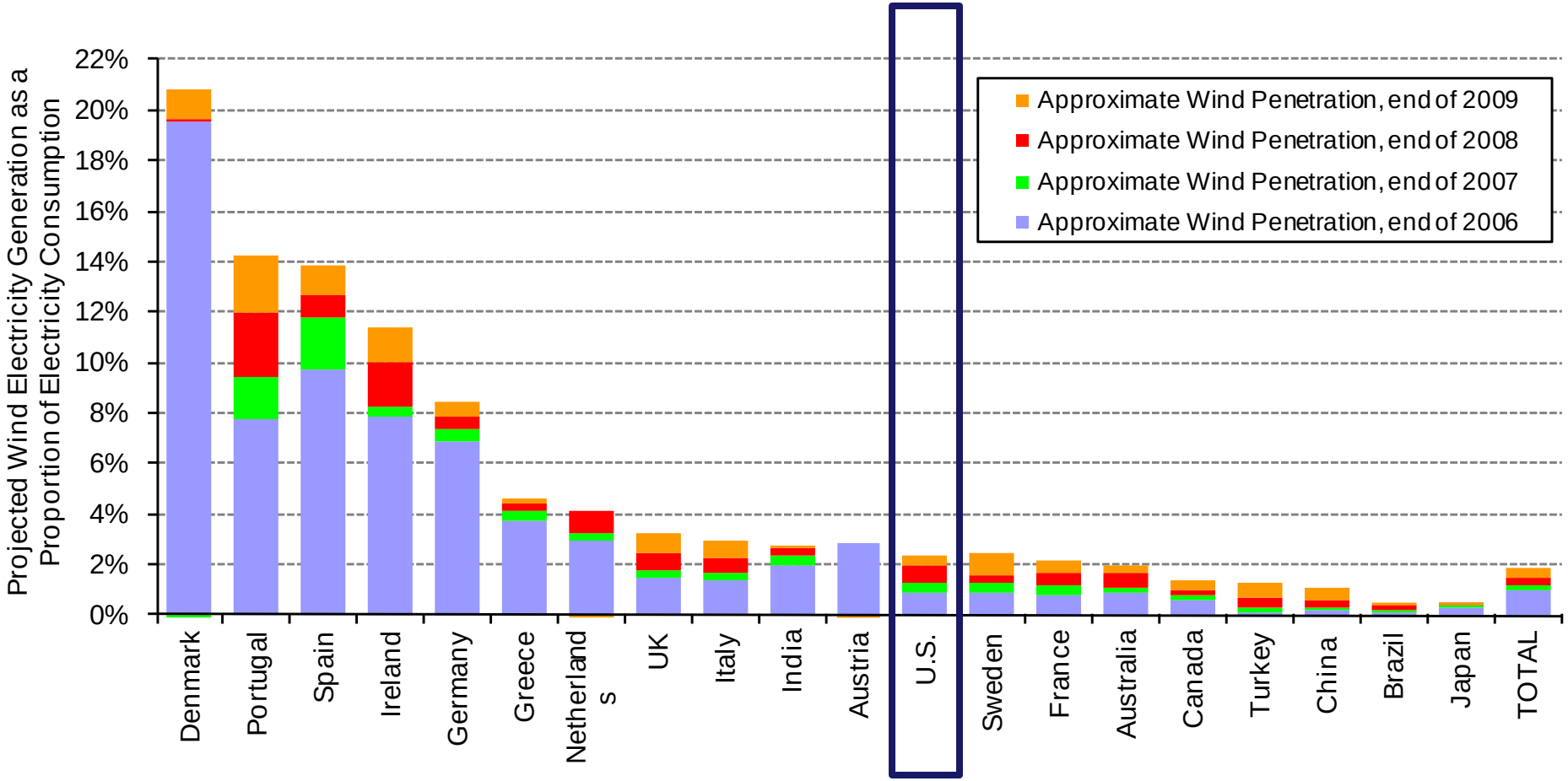
Source: Lawrence Berkeley National Laboratory, Electricity Markets and Policy Group

Wind Is a Major Source of New Capacity Additions: 39% in 2009



Source: EIA, Ventyx, AWEA, IREC, Berkeley Lab

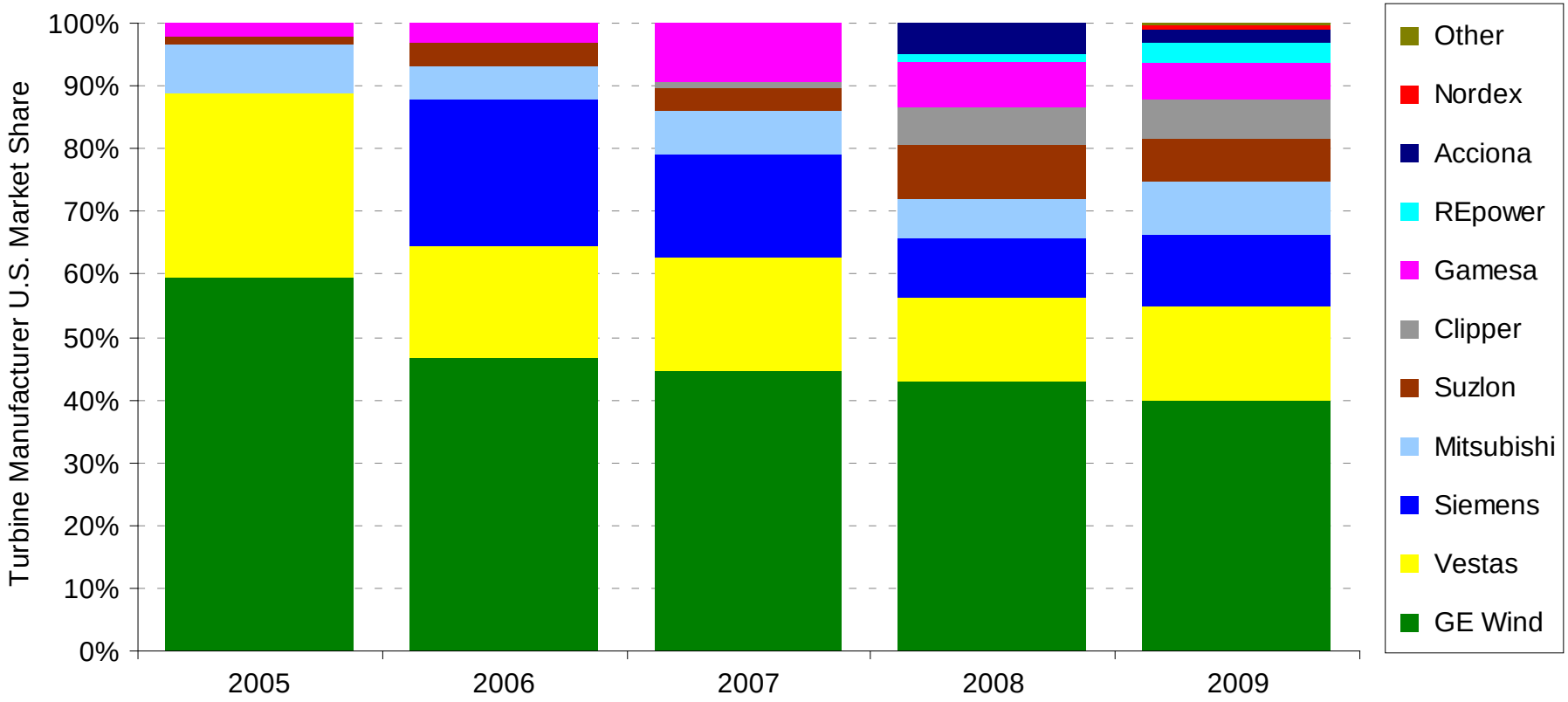
Wind Capacity at End of 2009 Could Deliver 2.4% of US Electricity Supply



Note: Figure only includes the 20 countries with the most installed wind capacity at the end of 2009

Source: Lawrence Berkeley National Laboratory: Electricity Markets and Policy Group

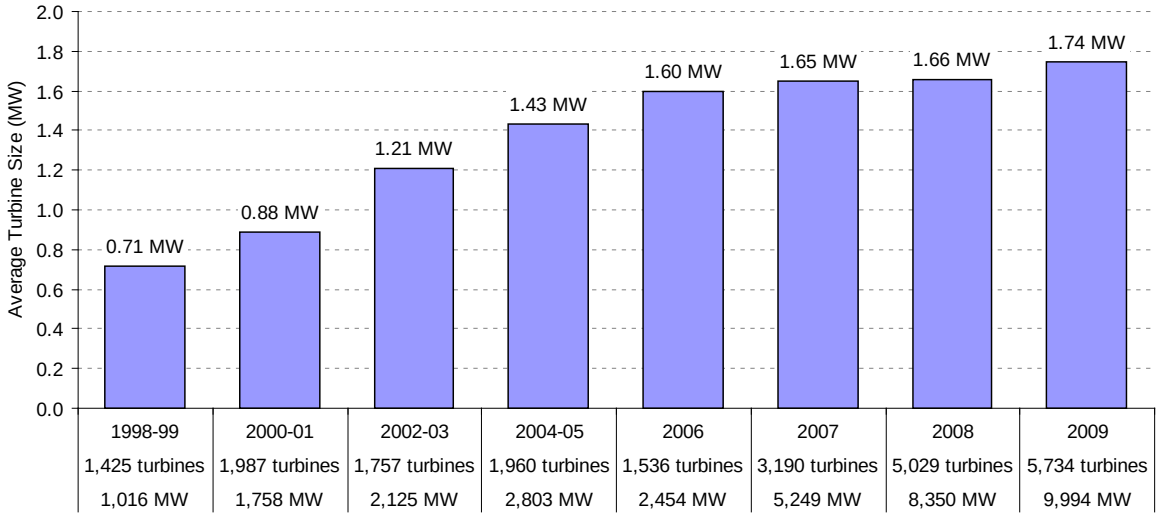
Growing Competition Among Wind Turbine Manufacturers



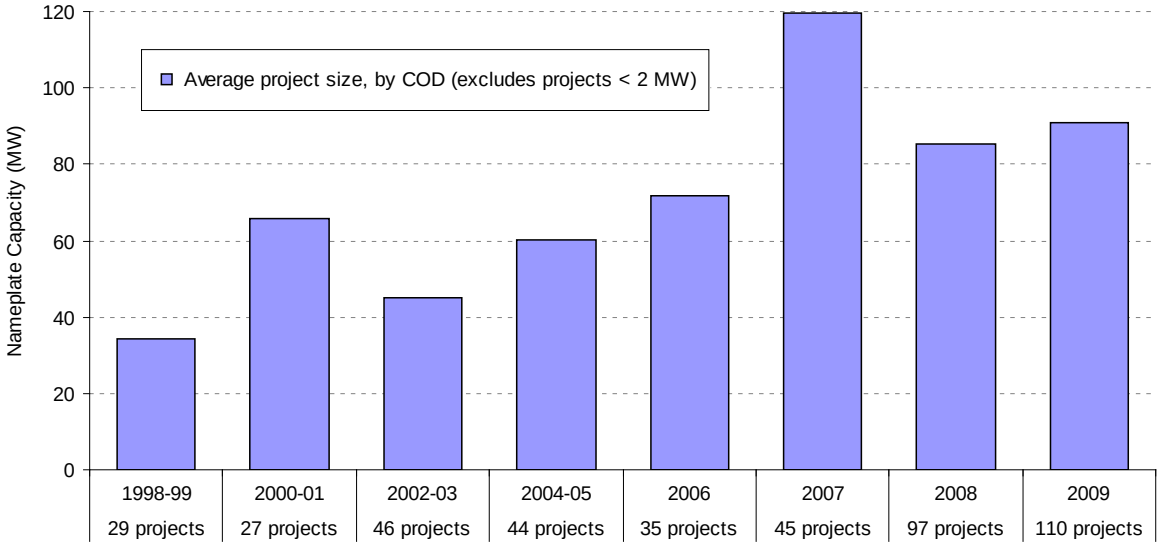
Source: Lawrence Berkeley National Laboratory: Electricity Markets and Policy Group

Average Turbine Size Increased in 2009; Average Project Size in 2009 = 90 MW

Average Turbine Size



Average Project Size



Source: LBNL, Electricity Markets and Policy Group

But… 2010 Is Expected To Be a Slow(er) Year for the US Wind Sector

Source	2010	2011	2012
EIA	7,300	10,200	10,300
BTM	8,000	10,000	15,000
NEF	7,000-8,500	7,500-9,000	8,000-9,000

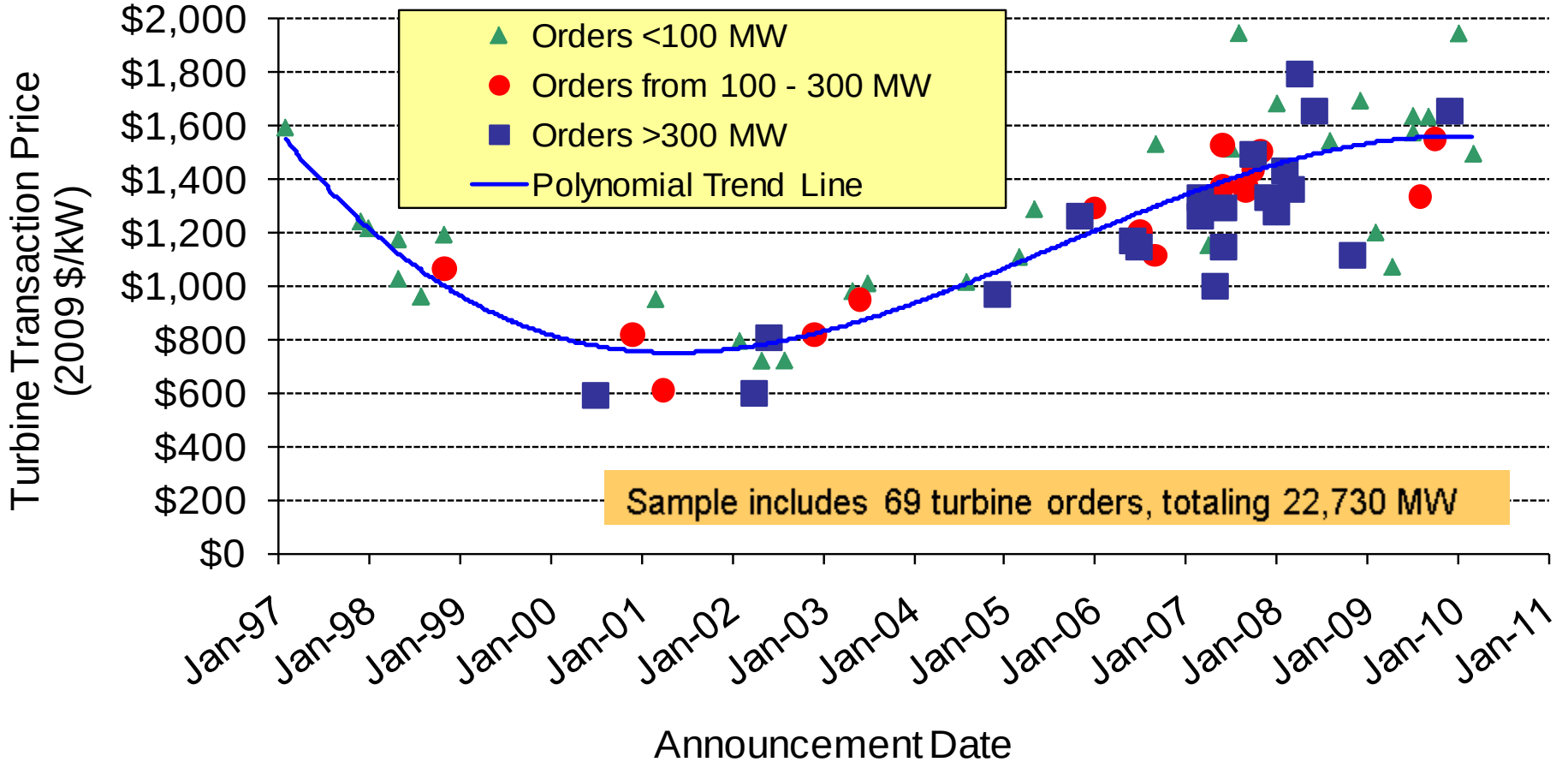
Source: LBNL, Electricity Markets and Policy Group

Headwinds May Require Further Policy Intervention

Investment climate	→	EESA 2008; ARRA 2009
Transmission investment	→	New federal/state policy needed?
Comparative economics	→	Federal/state RPS? Climate legislation?

Source: LBNL, Electricity Markets and Policy Group

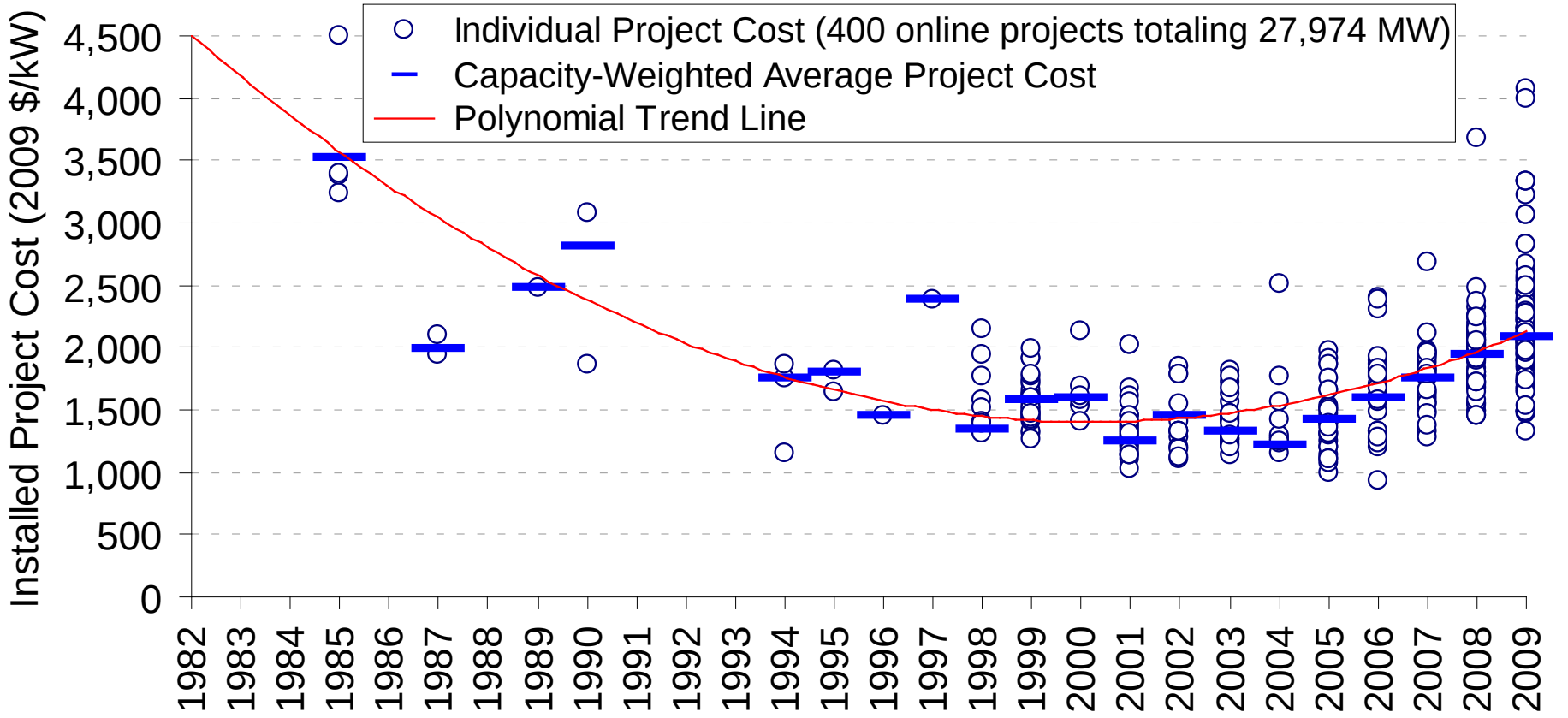
Wind turbine prices are easing, but are still high by historical standards



Turbine prices up by ~$800/kW from 2002 through 2009, but have softened since 2008 (though recent sample is small)

Source: LBNL, Electricity Markets and Policy Group

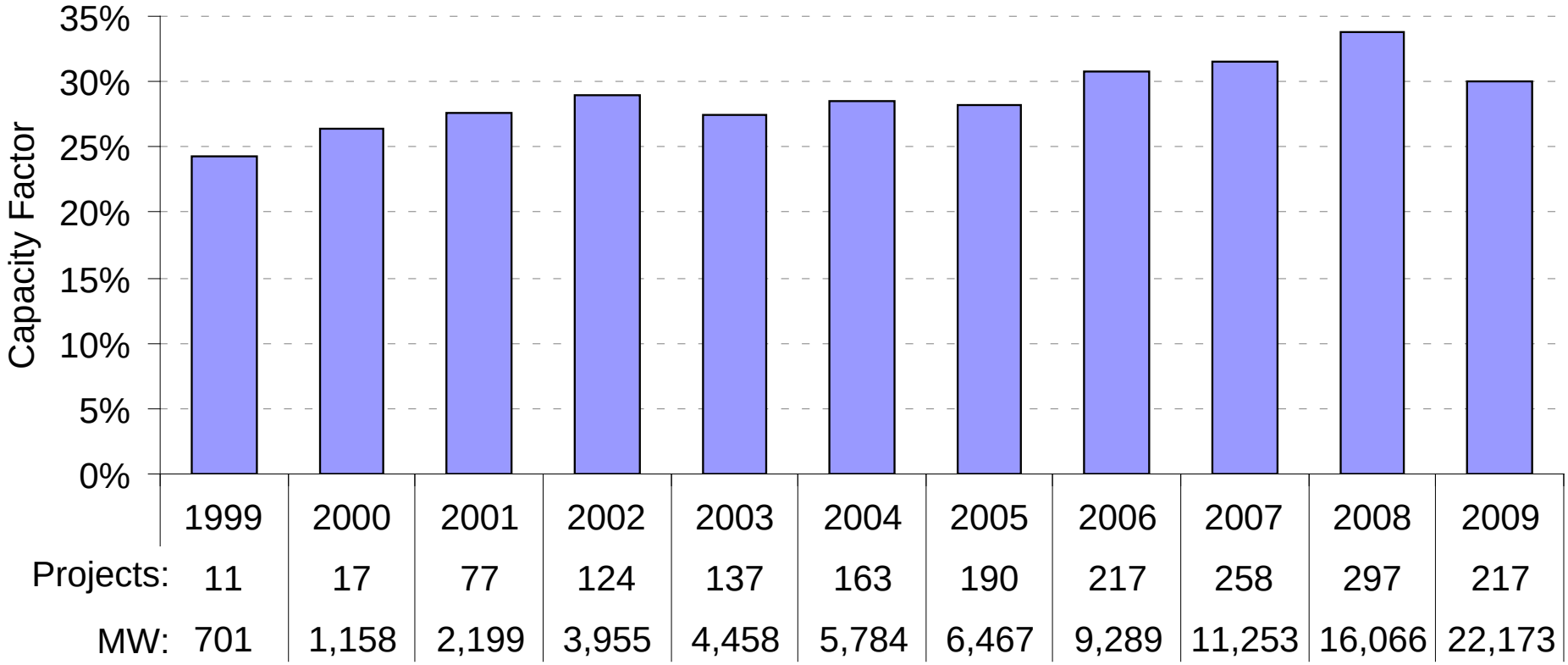
Wind Project Installed Costs in 2009 Continued to Rise, on Average



Project costs bottomed out in 2001-2004, and have risen by roughly $800/kW, on average, through 2009

Source: LBNL, Electricity Markets and Policy Group

Fleet-Wide Average Capacity Factors Have (Generally) Increased Over Time

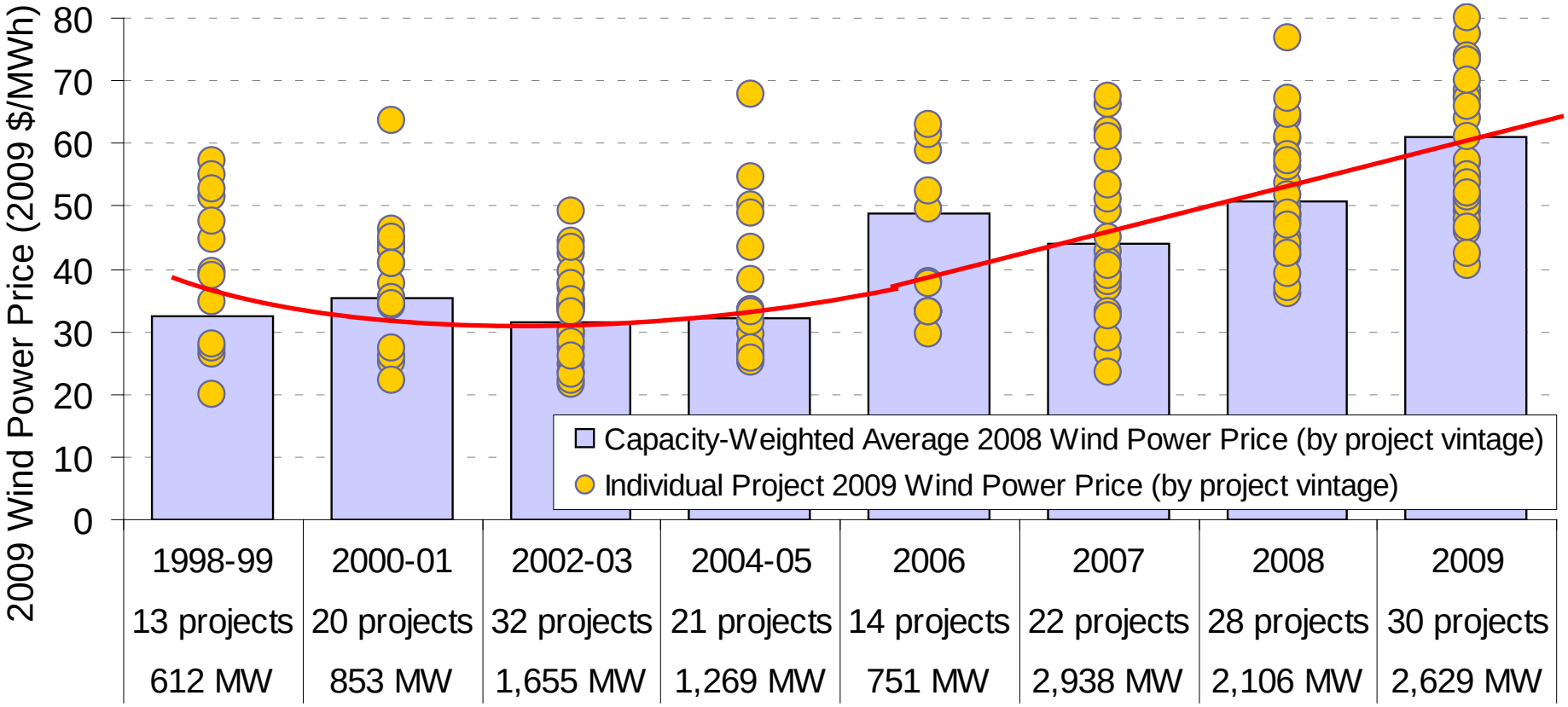


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Projects:	11	17	77	124	137	163	190	217	258	297	217
MW:	701	1,158	2,199	3,955	4,458	5,784	6,467	9,289	11,253	16,066	22,173

But… fleet-wide average capacity factor declined substantially in 2009 (30% in 2009 from 34% in 2008)

Source: LBNL, Electricity Markets and Policy Group

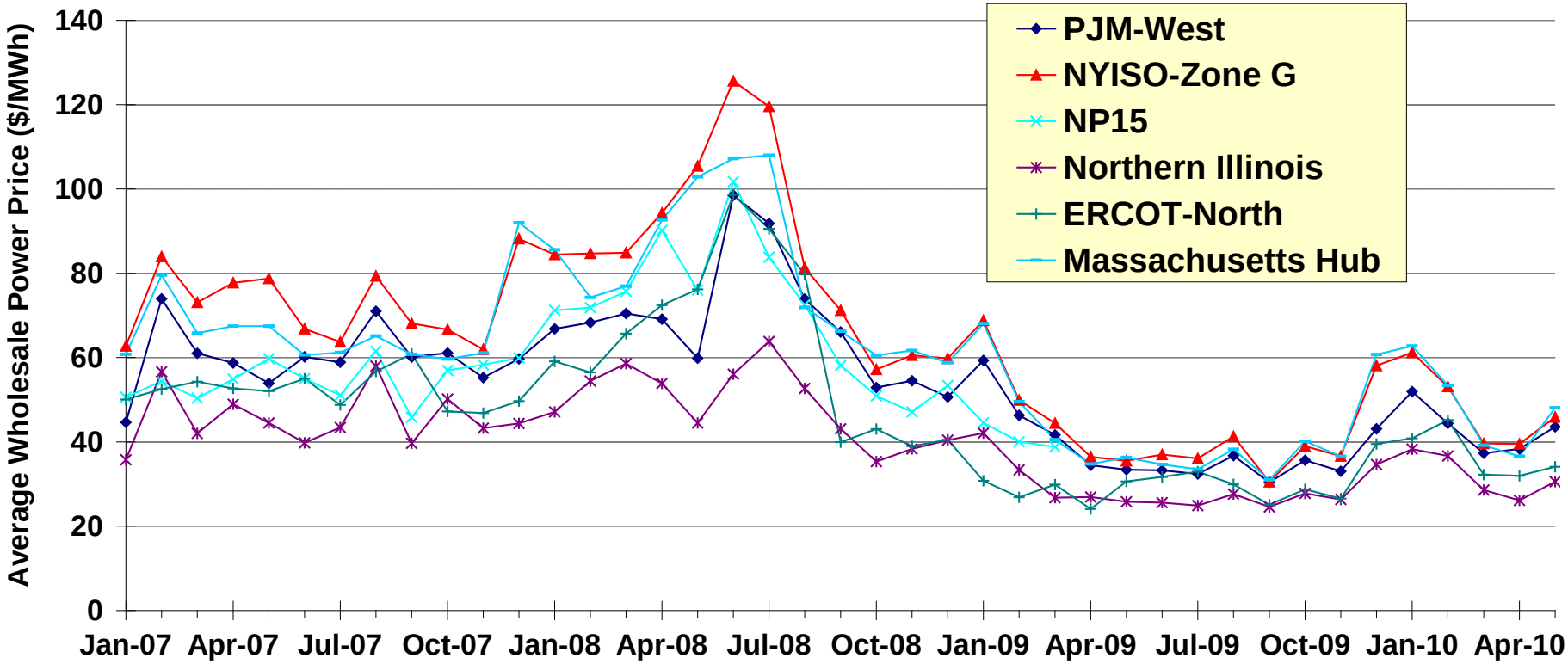
As a Result of Foregoing Trends, Wind Power Sales Prices Have Been Rising



- Wind power prices bottomed out with projects built in 2002-03
- Projects built in 2009 are ~$30/MWh higher on average

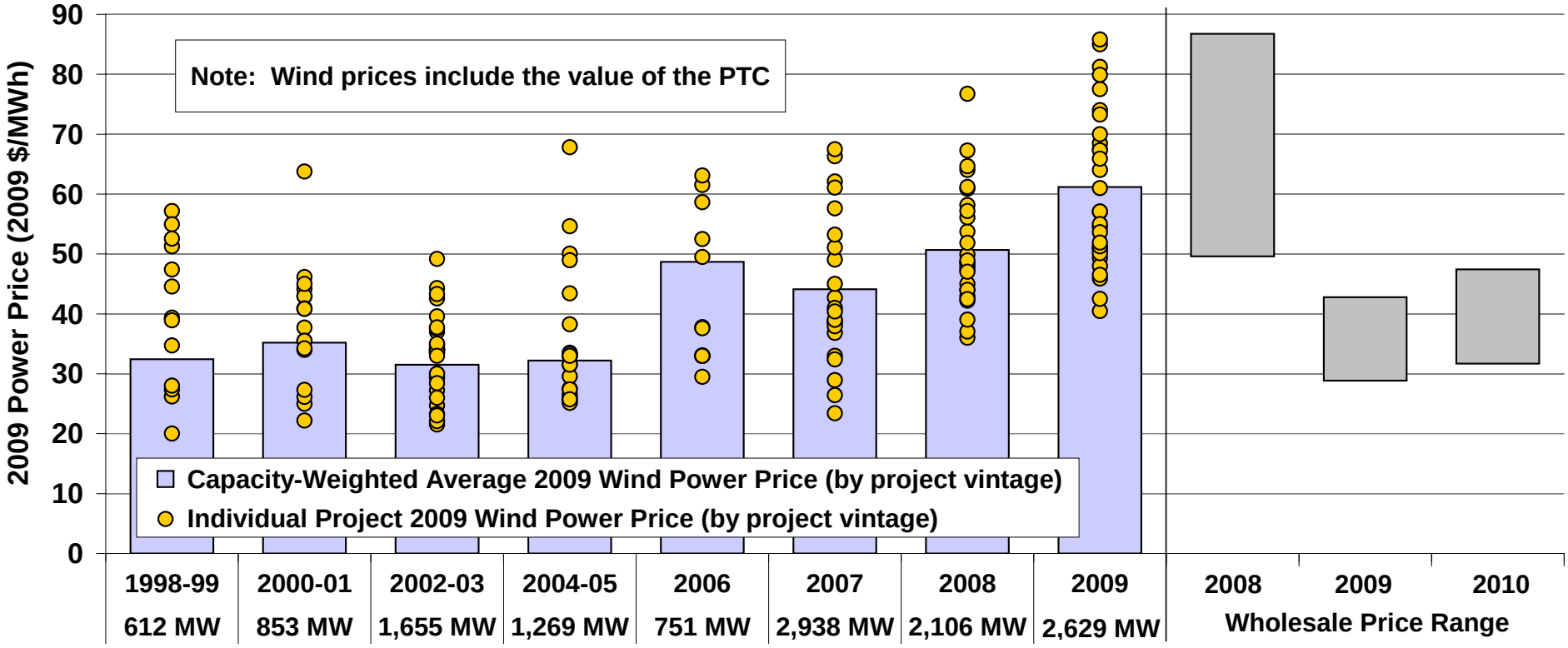
Source: LBNL, Electricity Markets and Policy Group

…While Wholesale Prices Have Recently Plummeted (with Natural Gas Prices)



Source: LBNL, Electricity Markets and Policy Group

As a Result, the Near-Term Economics of Wind Has Become More Challenging



Source: LBNL, Electricity Markets and Policy Group

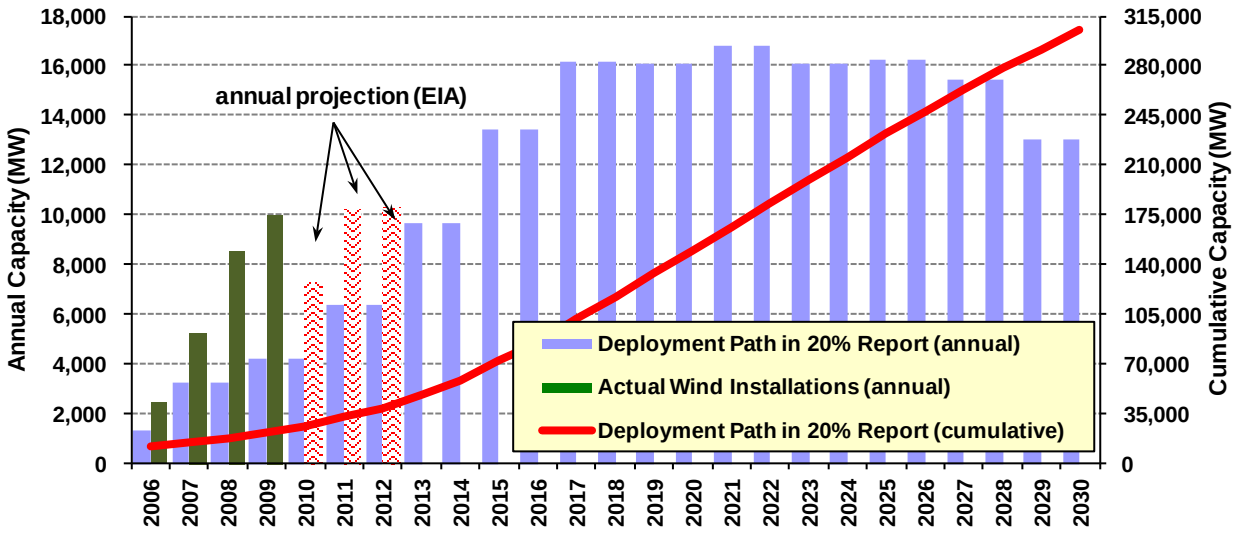
Forecasts

- The Energy Information Administration forecasts that wind power will provide 2.4% of the US electricity supply in 2030 (124 billion kWh, 40 GW)
  - This forecase makes no assumptions about climate change legislation or other drivers of policy
- The Waxman-Markey climate bill, which passed the House, called for a combined renewables/energy efficiency portfolio standard of 20% by 2020
- To meet 20% of projected demand in 2030, US wind power capacity would have to exceed 300 GW—an increase of more than 290 GW over the next 23 years (USDOE, *20% Wind by 2030*, July 2008)

Conclusions

- Wind industry has matured, giving it the standing to be a major contributor to the U.S. supply mix
- Wind energy's economic competitiveness in recent years has helped the sector beat its 20%-by-2030 pathway goals
- Though comparisons of long-term wind pricing to short-term wholesale markets does not tell the wind additions at risk

- Current state policies not enough to sustain 8,000+ MW/yr; more federal and state support may be necessary to enable continued growth



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