NAWEA 2015 Symposium
Wind Industry Market and Policy Overview

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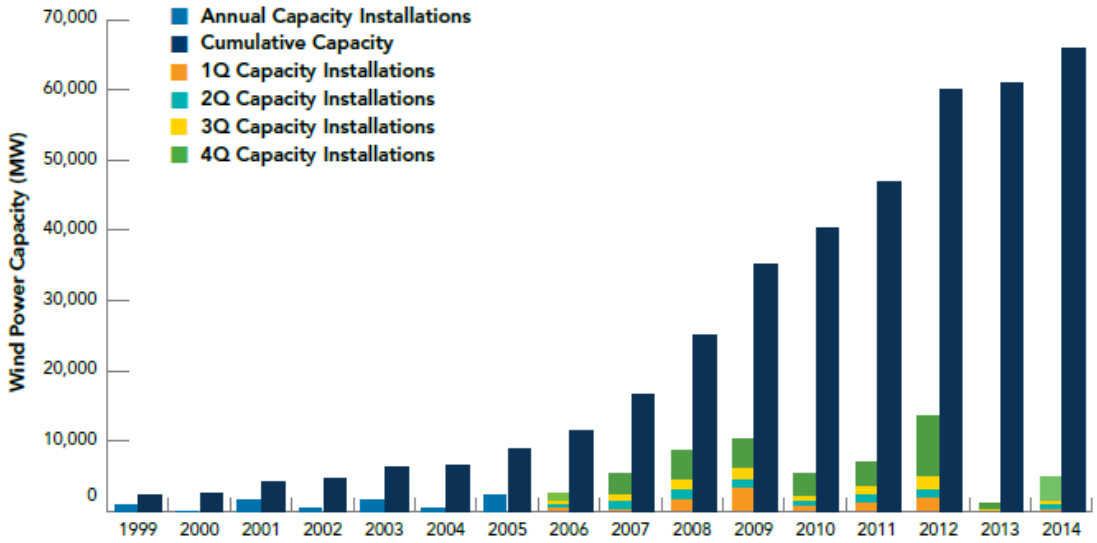
Overview of the Wind Energy Industry

- **U.S. Wind Market Data and Trends**
- **Policy Drivers of Wind**

U.S. Annual & Cumulative Wind Power Capacity Growth (Utility-Scale Wind)



Utility-Scale wind capacity includes installations of wind turbines larger than 100-kW for the purposes of the AWEA U.S. Wind Industry Annual Market Report. Wind turbines 100-kW and smaller are included in the U.S. Department of Energy Market Report on Wind Technologies in Distributed Applications. Annual capacity additions and cumulative capacity may not always add up due to decomissionings and repowers. Wind capacity data for each year is continuously updated as information changes.

Year	Annual Capacity Installations (MW)	Cumulative Capacity (MW)
1999	844	2,385
2000	71	2,456
2001	1,690	4,147
2002	411	4,557
2003	1,665	6,222
2004	396	6,619
2005	2,374	8,993
2006	2,457	11,450
2007	5,253	16,702
2008	8,362	25,065
2009	10,005	35,068
2010	5,216	40,283
2011	6,820	46,930
2012	13,131	60,012
2013	1,087	61,110
2014	4,854	65,877

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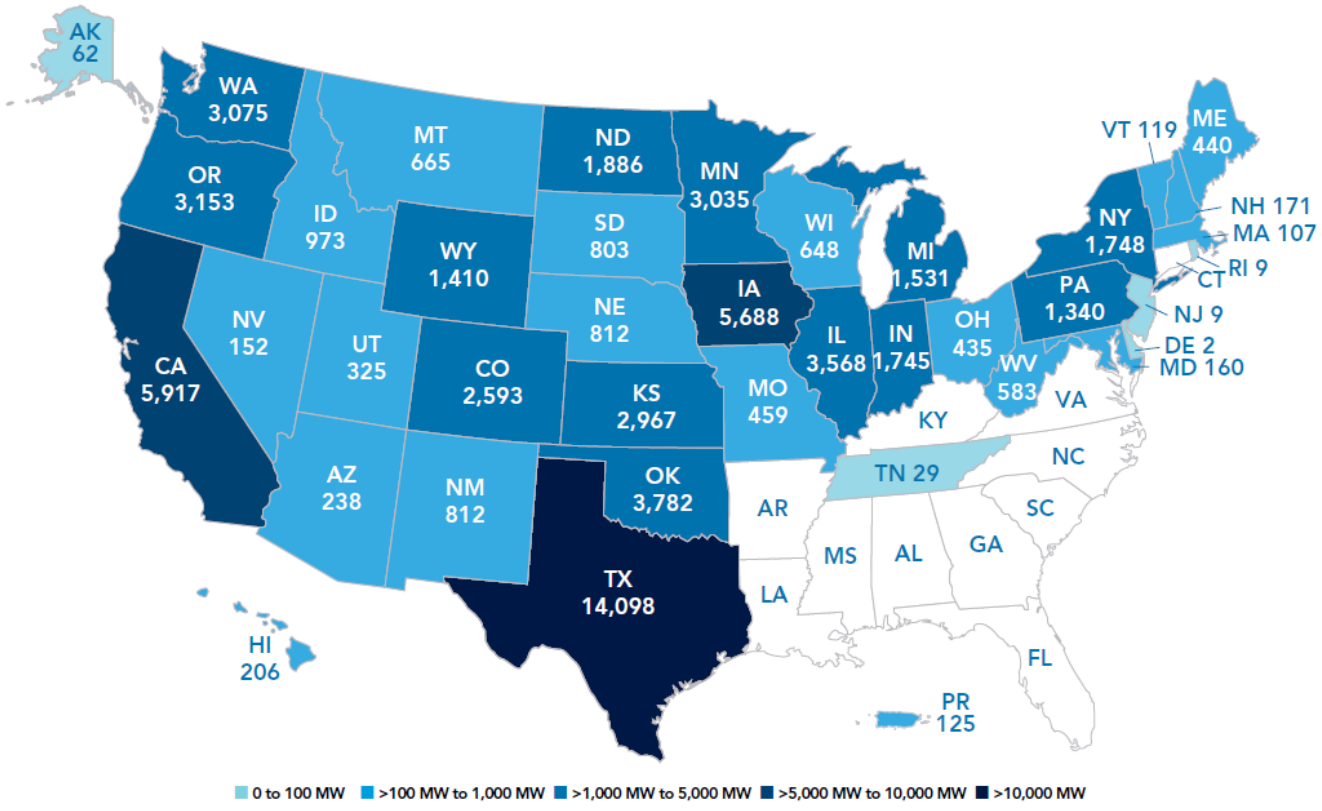
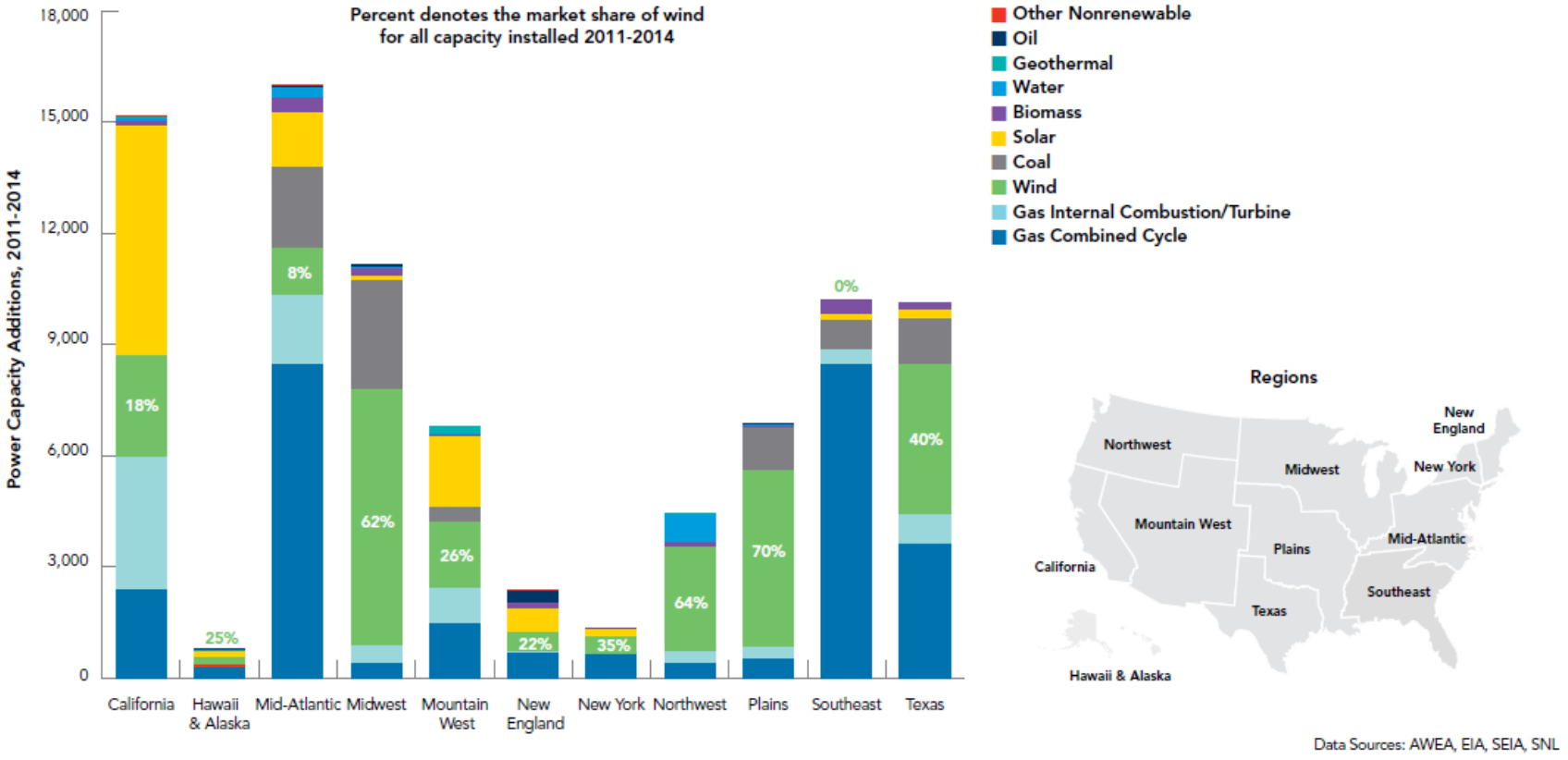
Wind Capacity Installations, by State



Wind Capacity Installations 2011-2014, by Region



- Wind provided 80% of all new capacity installed in IA, MN, ND, and SD.

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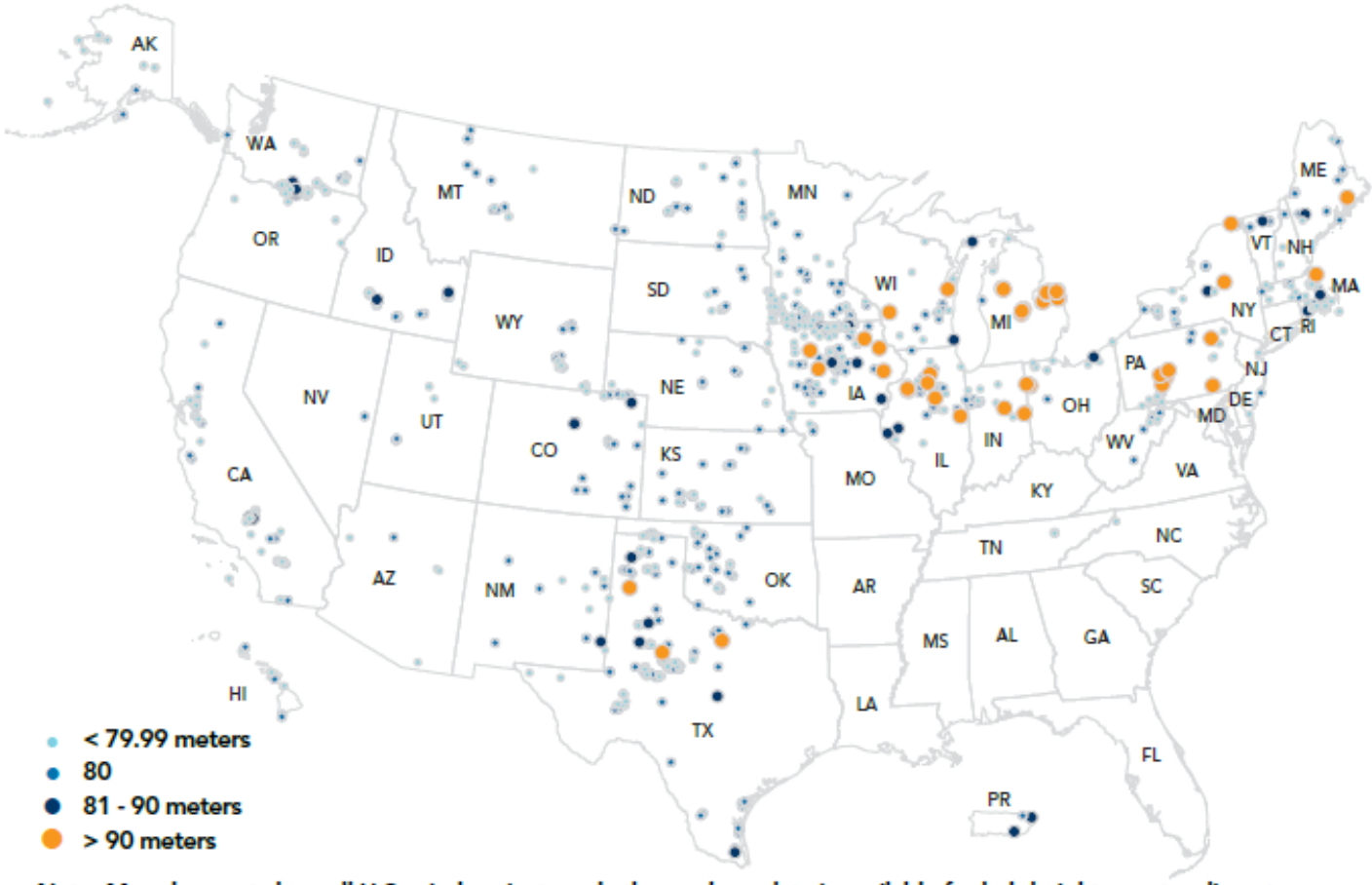
Wind Projects, by Hub Height



Note: Map does not show all U.S. wind projects, only those where data is available for hub height or rotor diameter.

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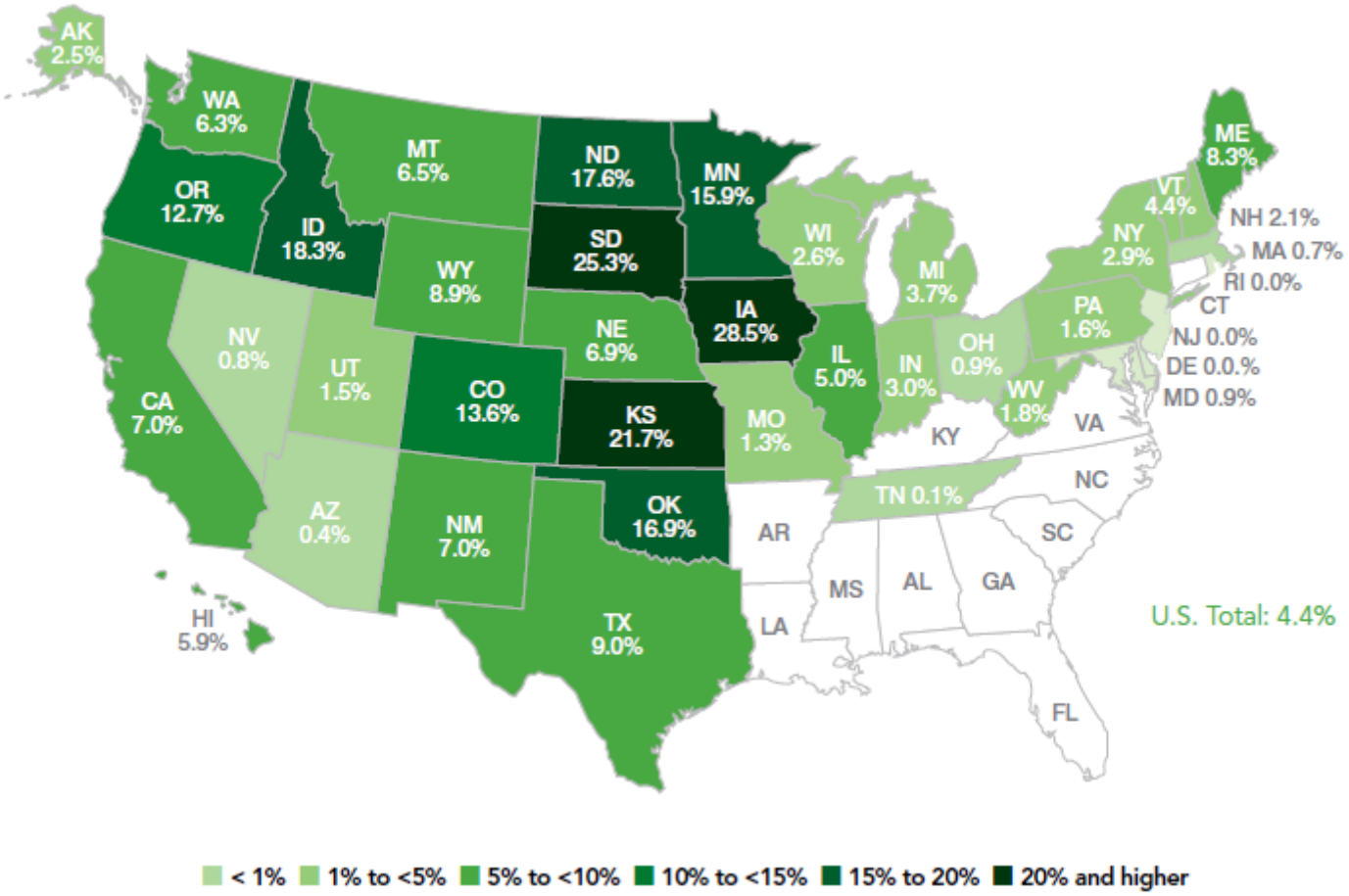
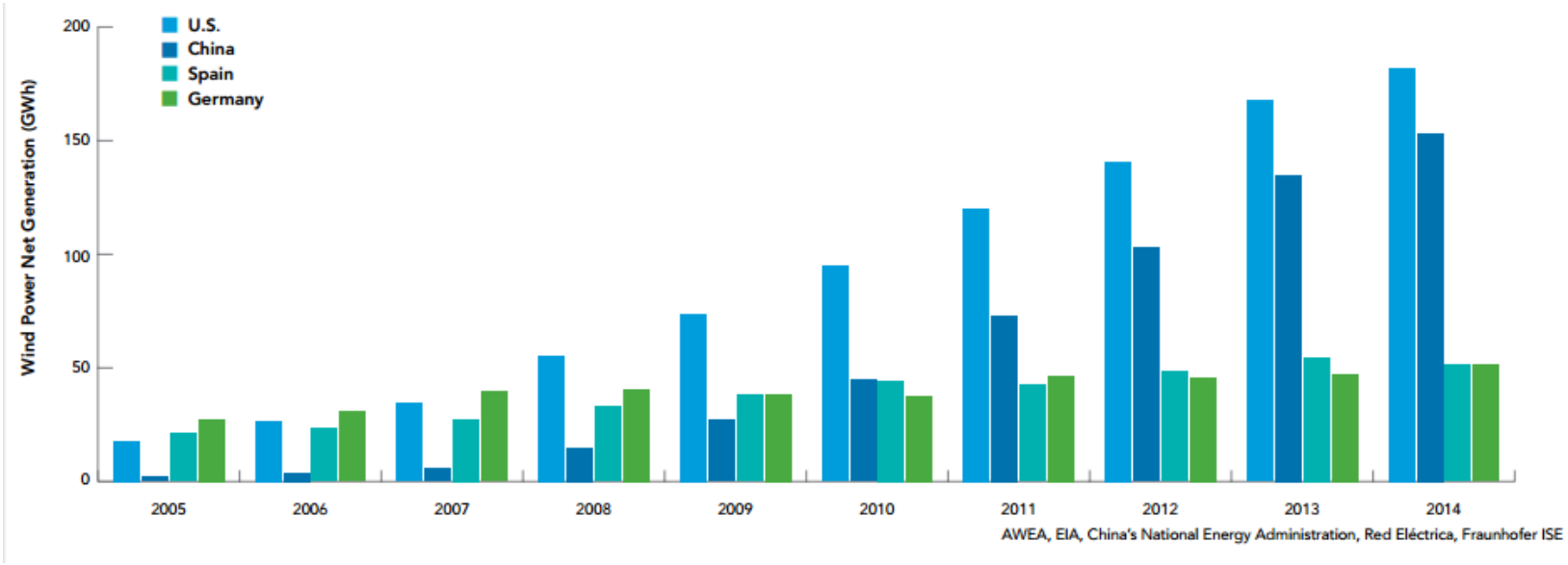
U.S. is Reliably Integrating Large Amounts of Wind



Global Wind Power Generation over Time



- U.S. leads the world in wind energy generation, producing over 181 billion kWh of wind energy compared to China's 153 billion kWh.

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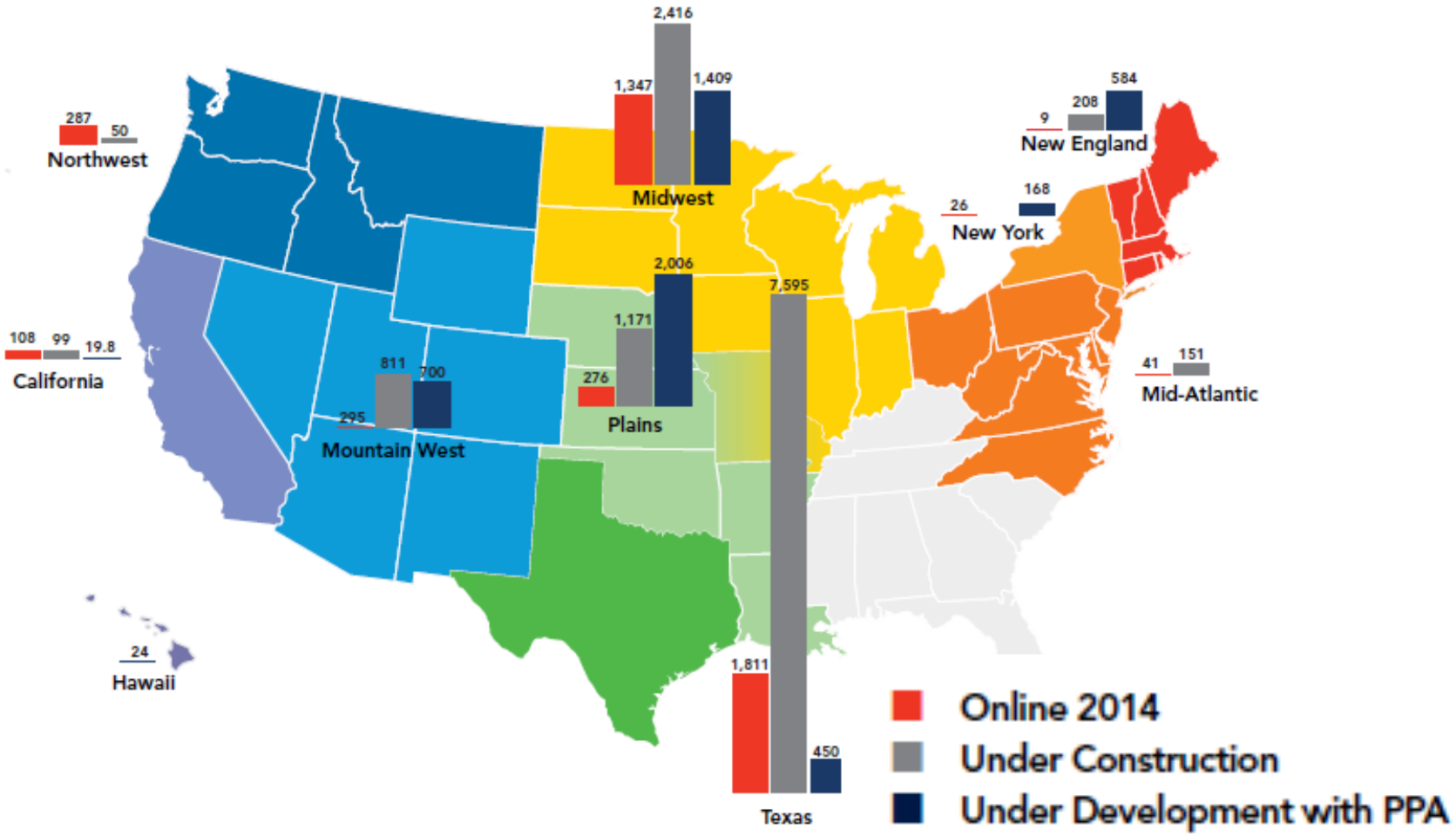
Under Construction Activity



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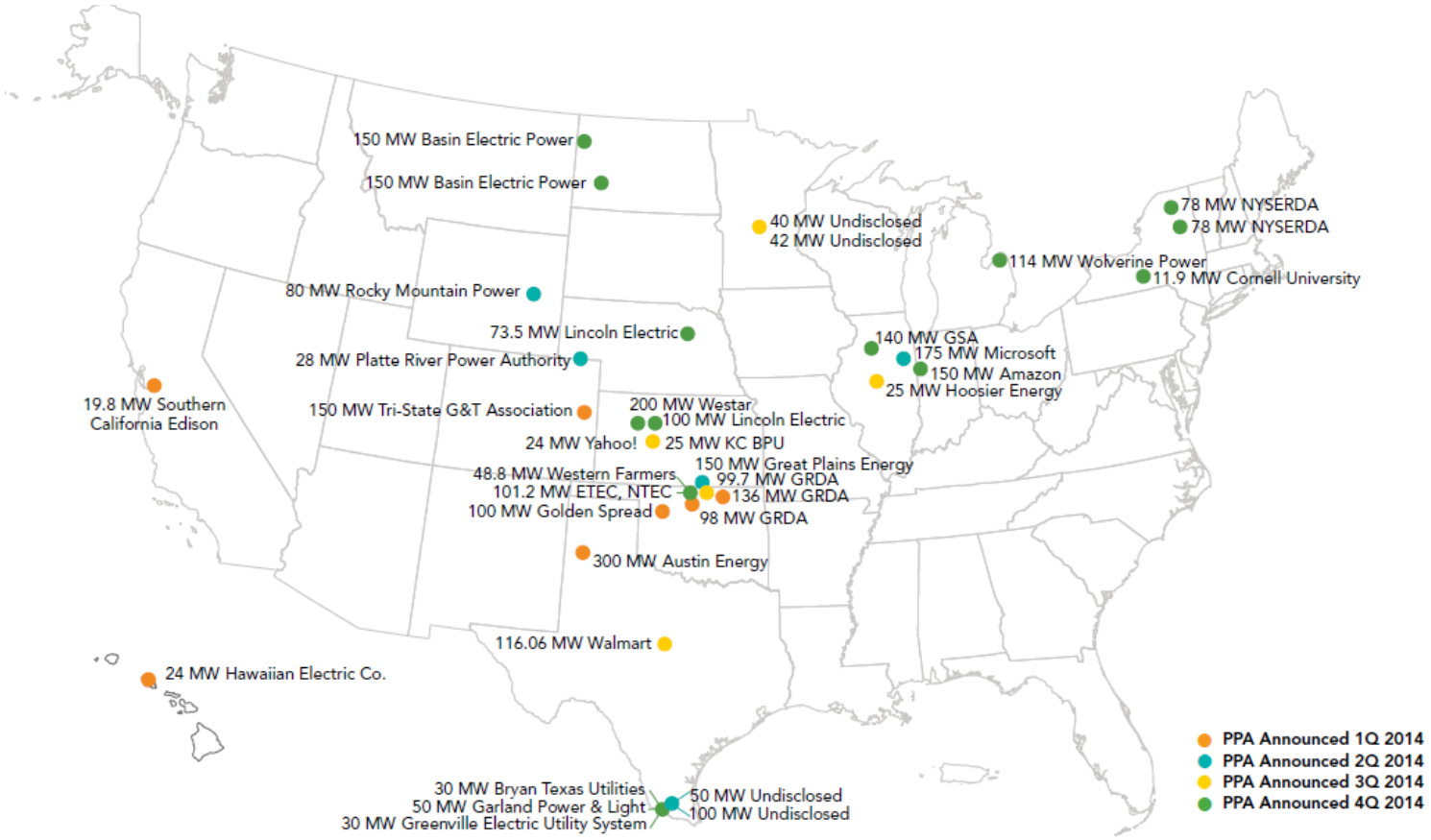
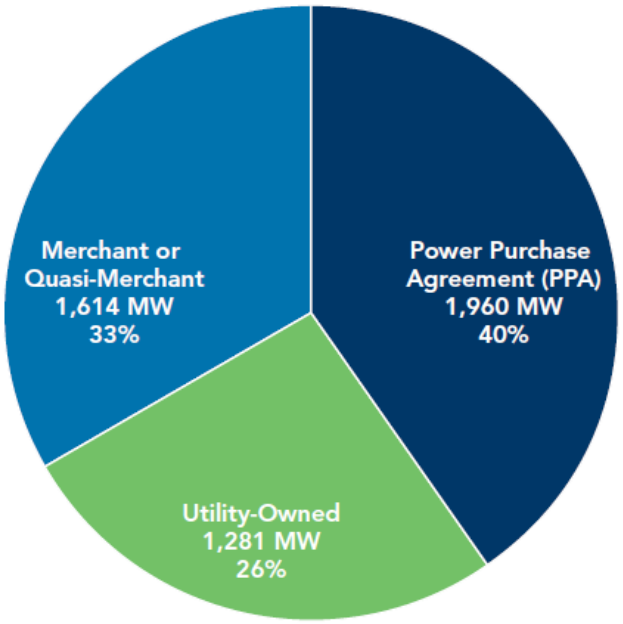
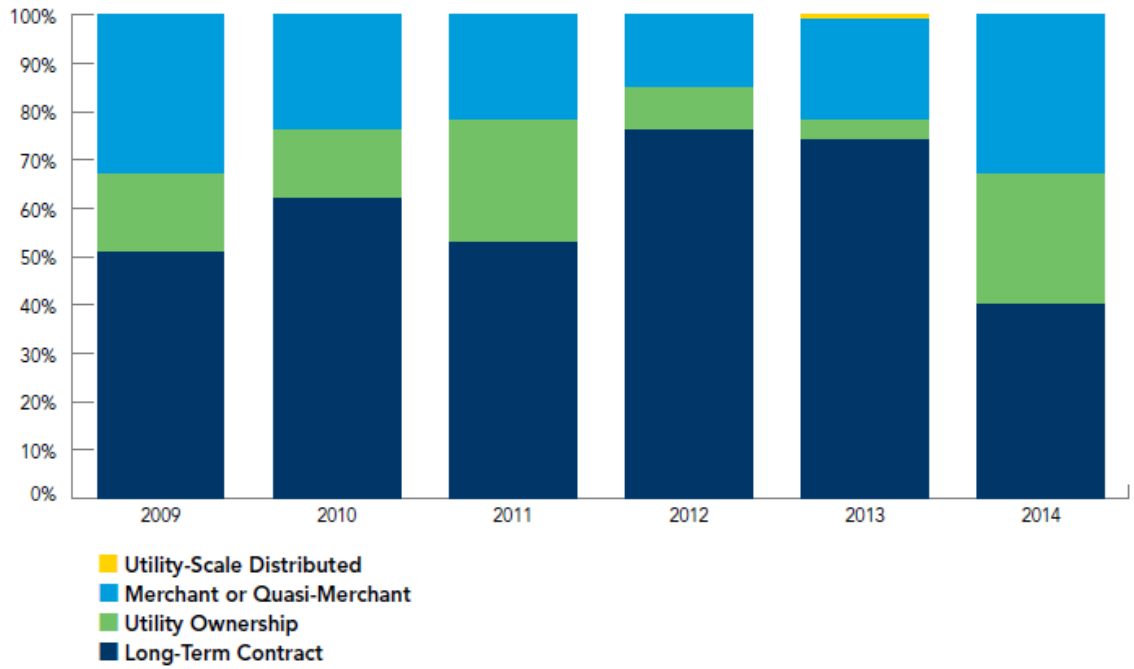
Record number of long-term contracts signed 2013-14



U.S. Wind Power Capacity Offtake





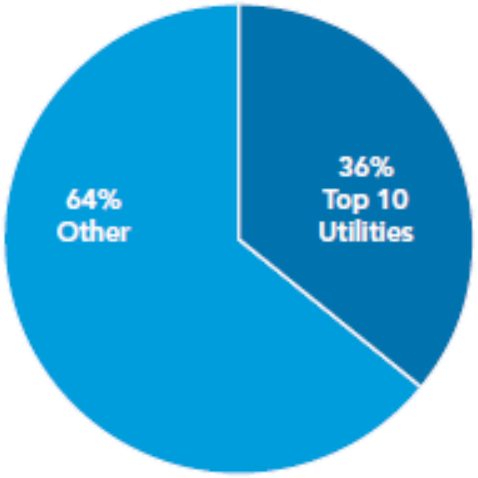
- Merchant projects in Texas may include hedge contracts
- 62% of all wind energy procured through long-term PPAs between IPPs and the power purchaser.

Who's Purchasing Wind Power?

Top 10 Electric Utilities with Wind Power Capacity on System (owned or under contract)

Ranking	Company	Capacity, MW
1	Xcel Energy	5,736
2	Berkshire Hathaway Energy*	4,992
3	Southern California Edison	3,531
4	American Electric Power	2,185
5	Pacific Gas & Electric	2,060
6	Tennesse Valley Authority	1,572
7	San Diego Gas & Electric	1,078
8	CPS Energy	1,059
9	Los Angeles Department of Water & Power	969
10	Alliant Energy	884

Percent of Operating Wind Capacity on Top 10 Electric Utility Systems



- Top Cooperative Utility: Basin Electric Power Cooperative (716 MW)
- Top Public Utility: CPS Energy (1,059 MW)
- Cooperative utilities signed 23% of the 3,300 MW of total new PPAs during 2014.

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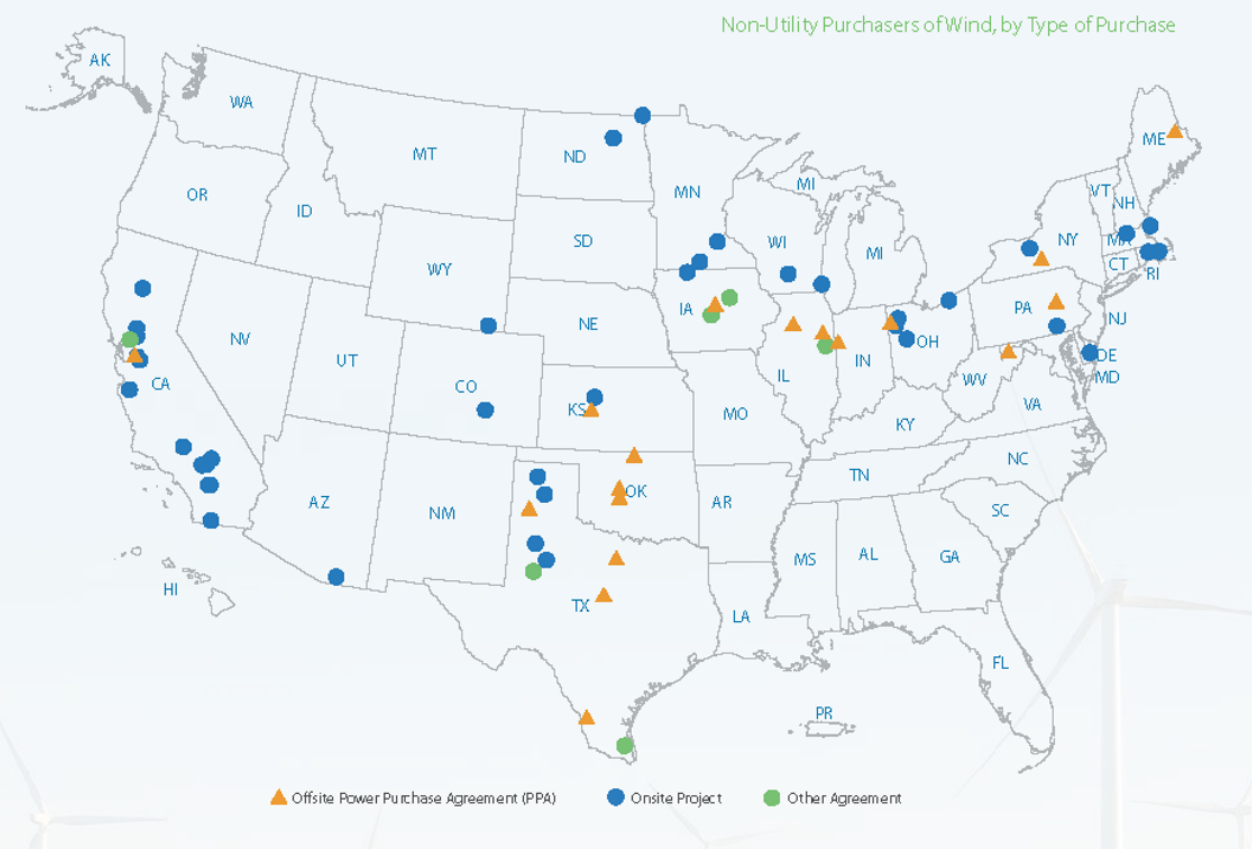
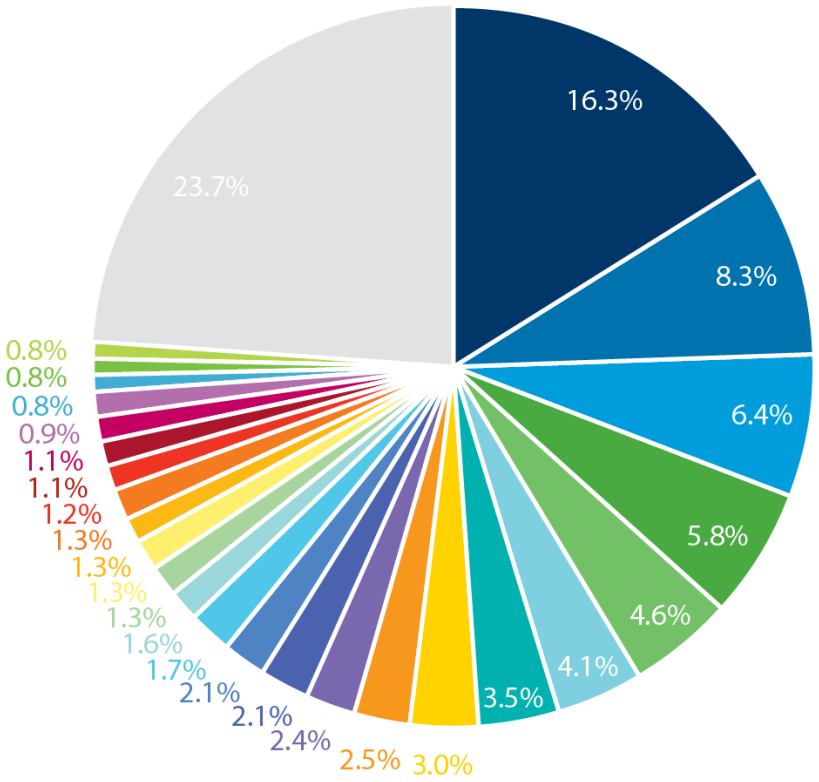
Growth in Non-Utility Purchasers



Who Owns the Wind Projects?



Ranking	Company	Capacity, MW
1	NextEra Energy Resources*	10,723
2	Iberdrola Renewables	5,443
3	Berkshire Hathaway Energy**	4,243
4	EDP Renewables North America LLC	3,805
5	Invenergy	3,037
6	NRG***	2,708
7	E.ON Climate & Renewables	2,291
8	EDF Renewable Energy	1,983
9	Duke Energy	1,627
10	BP Wind	1,558
11	Enel Green Power North America	1,392
12	Exelon & Constellation	1,383
13	Infigen Energy	1,089
14	Pattern Energy Group Inc.	1,052
15	First Wind	874

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Policy Drivers of Wind

Federal Policy: Production Tax Credit (PTC)

- **PTC expired in law in 1999, 2001, 2003, 2012, 2012, 2013, and 2014.**

- **PTC was set to expire in 2005, 2007, 2008, 2009, but extended prior to expiration.**

- **Two week PTC extension in December 2014 included language to qualify physical construction activity or 5% safe harbor; expired again on December 31, 2014.**

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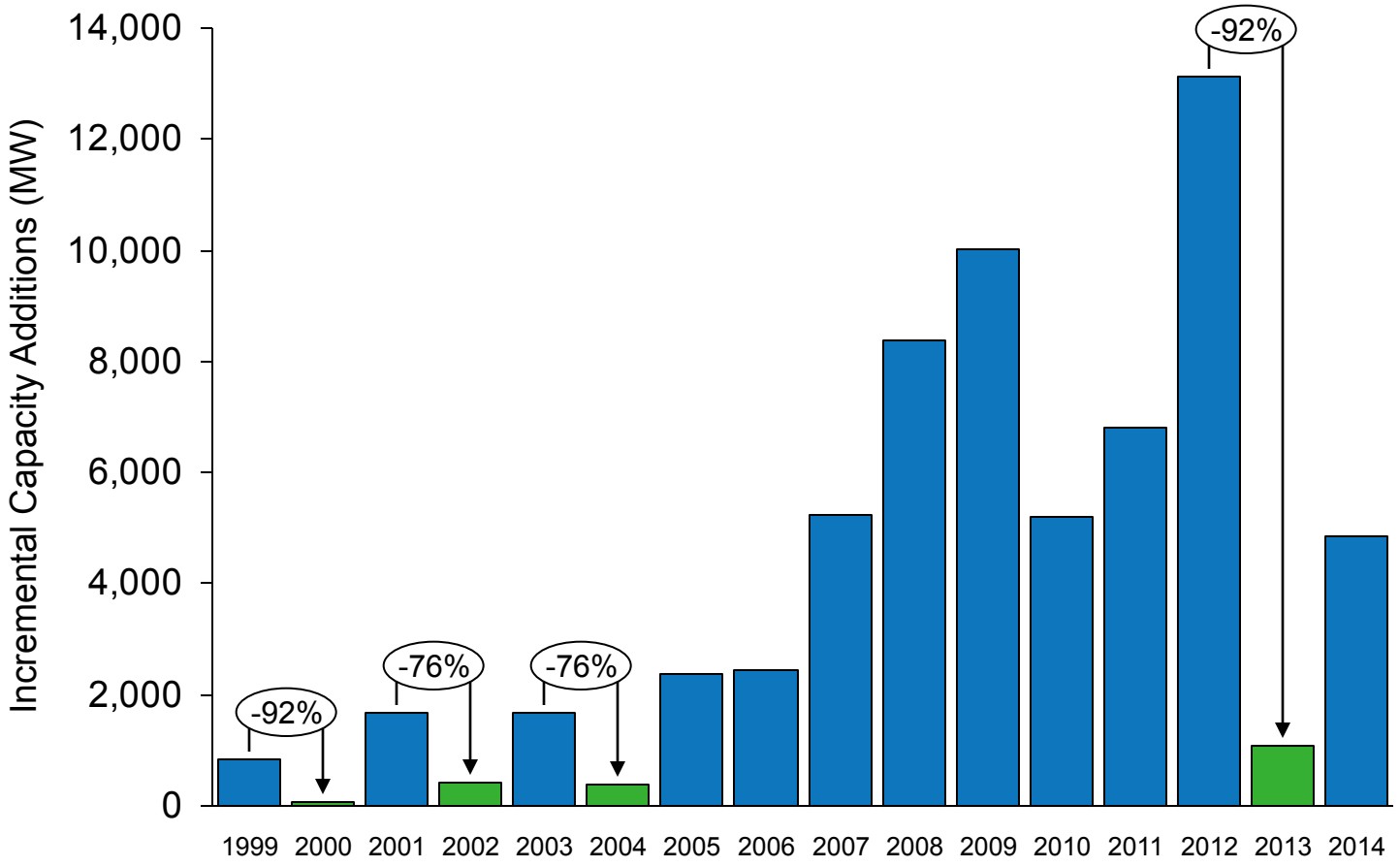
Boom and Bust Cycle



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Manufacturers with Turbines Installed in US, by Year

2006	2007	2008	2009	2010	2011	2012	2013	2014
GE Energy	GE Energy	GE Energy	GE Energy	GE Energy	GE Energy	GE Energy	GE Energy	GE Energy
Siemens	Vestas	Vestas	Vestas	Siemens	Vestas	Siemens	Siemens	Siemens
Vestas	Siemens	Siemens	Siemens	Gamesa	Siemens	Vestas	Sany	Vestas
Mitsubishi	Gamesa	Suzlon	Mitsubishi	Suzlon	Suzlon	Gamesa	Vestas	Nordex
Suzlon	Mitsubishi	Gamesa	Suzlon	Mitsubishi	Mitsubishi	Senvion	EWT Americas	Gamesa
Gamesa	Suzlon	Mitsubishi	Gamesa	Vestas	Nordex	Mitsubishi	PowerWind	PowerWind
	Clipper	Clipper	Clipper	Acciona	Clipper	Nordex	Vergnet	RRB Energy Ltd.
	Nordex	Vestas	Senvion	Clipper	Senvion	Clipper		Refurbished
		Senvion	Vestas	Senvion	Gamesa	Acciona		
		Fuhrlander	Clipper	DeWind	Alstom	Suzlon		
		DeWind	Nordex	Nordex	Sany	Goldwind		
		AWE	DeWind	Northern Power	VENSYS	DeWind		
		VENSYS	AAER/Pioneer	Samsung	Samsung	CCWE		
		RBB	Fuhrlander	Nordic	Goldwind	Guodian		
		Entegrity	Goldwind	DanWind	Hyundai	Sinovel		
		DES	Northern Power	EWT Americas	Nordtank (refurbished)	Hyundai		
		Northern Power	VENSYS	Turbowinds	Kenersys	HZ Windpower		
			RRB Energy Ltd.	AAER/Pioneer	Northern Power	PowerWind		
			EWT Americas	PowerWind	Sinovel	VENSYS		
			Elecon	Elecon	Unison	EWT Americas		
			WES		Nordic	Kenersys		
			Norwin		PowerWind	Aeronautica		
					Aeronautica	Sany		
					Elecon	Leitner-Poma		
					Turbowinds	Turbowinds		
					WES	Vergnet		
					Siva	Siva		
						Refurbished		

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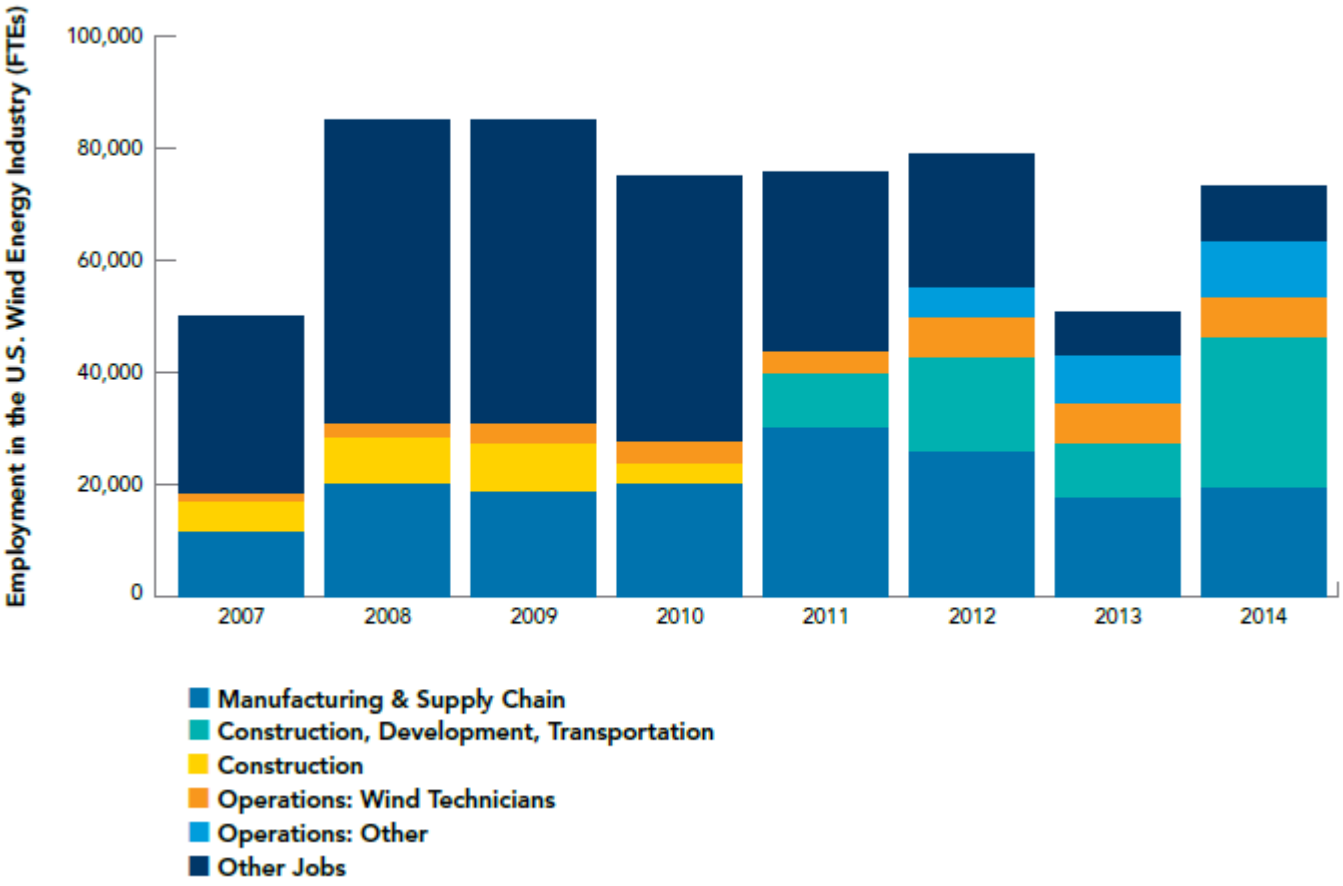
73,000 Jobs Supported by Wind Industry in 2014



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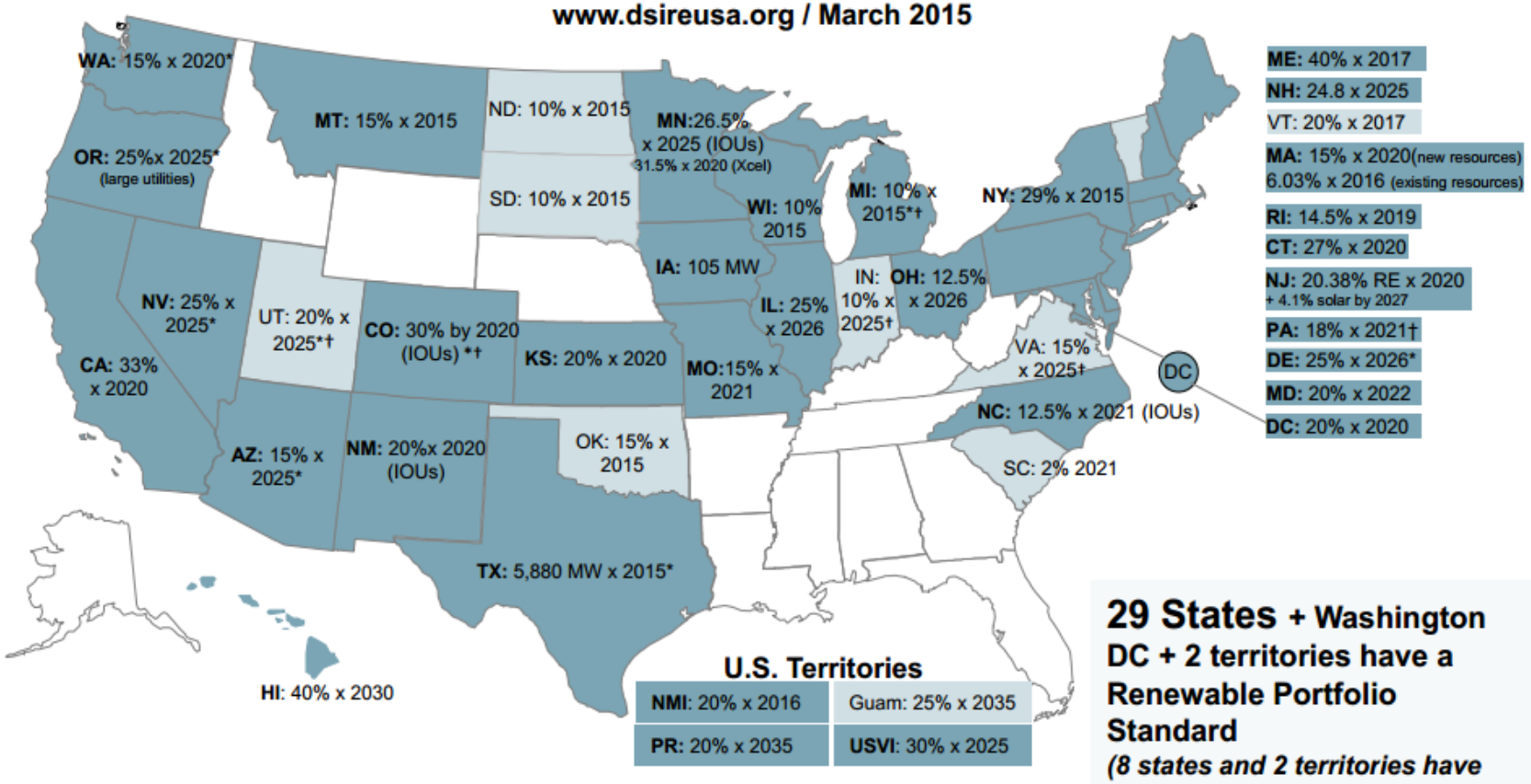
Renewable Portfolio Standard Policies

www.dsireusa.org / March 2015



U.S. Territories

NMI: 20% x 2016	Guam: 25% x 2035
PR: 20% x 2035	**USVI**: 30% x 2025

29 States + Washington DC + 2 territories have a Renewable Portfolio Standard
(8 states and 2 territories have renewable portfolio goals)

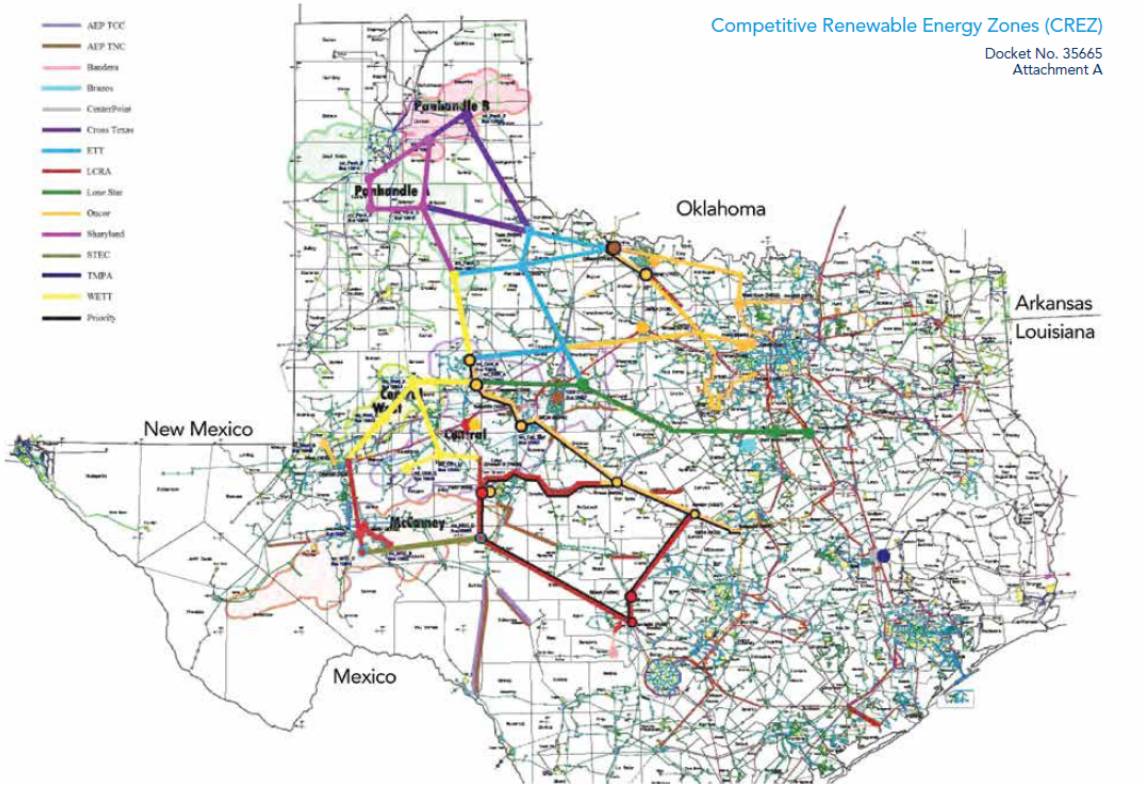
Renewable portfolio standard

Renewable portfolio goal

* Extra credit for solar or customer-sited renewables

† Includes non-renewable alternative resources

Successful State Policy



DOE Wind Vision: 20% Wind Energy by 2030

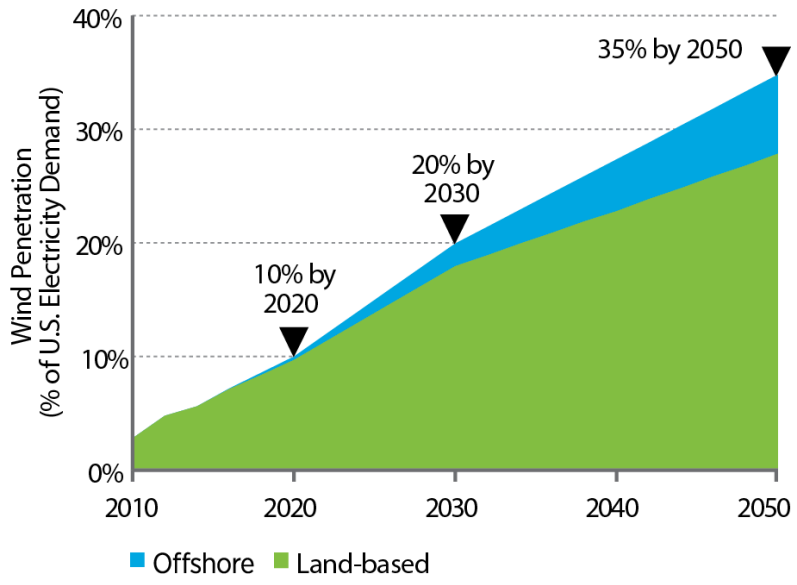
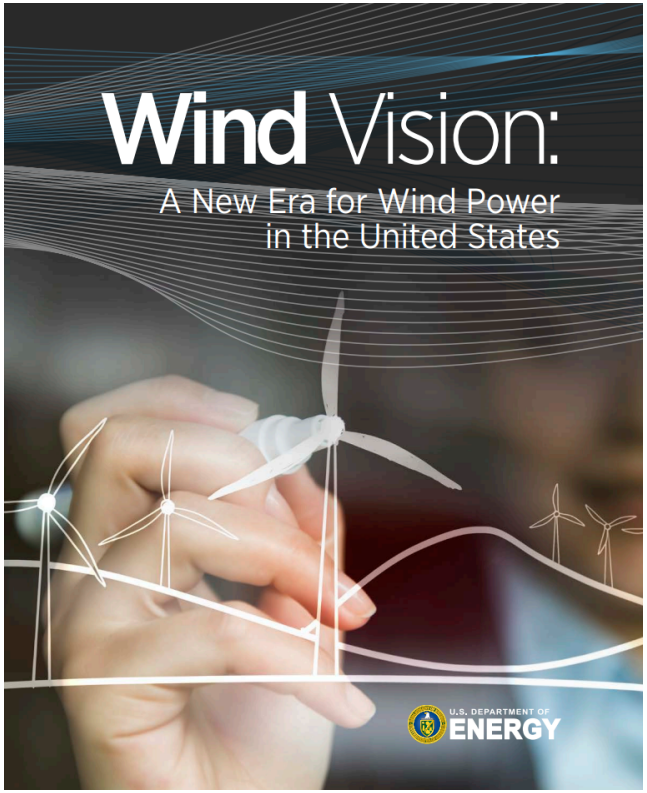


Figure 3. The Wind Vision Study Scenario , with contributions from land-based and offshore technology



EPA Clean Power Plan

- Carbon regulations for both new (under 111(b) of the Clean Air Act) and existing power plants (under 111(d))
- 30% reduction in power sector CO2 emissions by 2030, below 2030 levels
- Final ruling expected at the end of the summer, states will have 13 months to submit final plan but expect extension requests
- Assigns each state an emissions rate goal, in pounds of carbon dioxide (CO2) per megawatt hour (MWh), proposed option for mass-based goal
- "Building block" options to cut carbon emissions
  - Fossil fuel plant efficiencies
  - Shifting generation from coal to natural gas
  - Renewable energy capacity additions
  - Energy Efficiency in buildings and industries
- Additionally, states can also join together in multi-state or regional compacts to find the lowest cost options for reducing their carbon emissions.

EIA Analysis of CPP Impacts

- In Base Policy Scenario, optimal compliance mix results in wind adding adding 317 million megawatt-hours (MWh) by the year 2030 compared to Reference Scenario, more than half of the optimal compliance mix