Renewable Energy: Where Are We and Where Are We Headed?

Presented by:
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STOEL RIVES LLP
ATTORNEYS AT LAW

June 27, 2013 ● Tulalip, WA

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USA
2012
Leading Firm

Stoel Rives is pleased to announce that is has received National rankings for its **Renewables and Alternative Energy practice** from ***Chambers USA***. **Chambers and Partners** annual rankings are a result of extensive independent research conducted among in-house counsel, corporate executives and leading attorneys.

2013
BEST
LAW FIRMS
U.S.News & WORLD REPORT
Best Lawyers®

The firm is also pleased to announce that for the third year in a row it has received a **National First-Tier ranking** for its **Energy Law practice**, an honor achieved by only a select number of law firms in the country.

Approximate World Consumption of Renewable Energy

‹ 1%

‹1% – 2%

2% – 5%

5% – 10%

10% – 20%

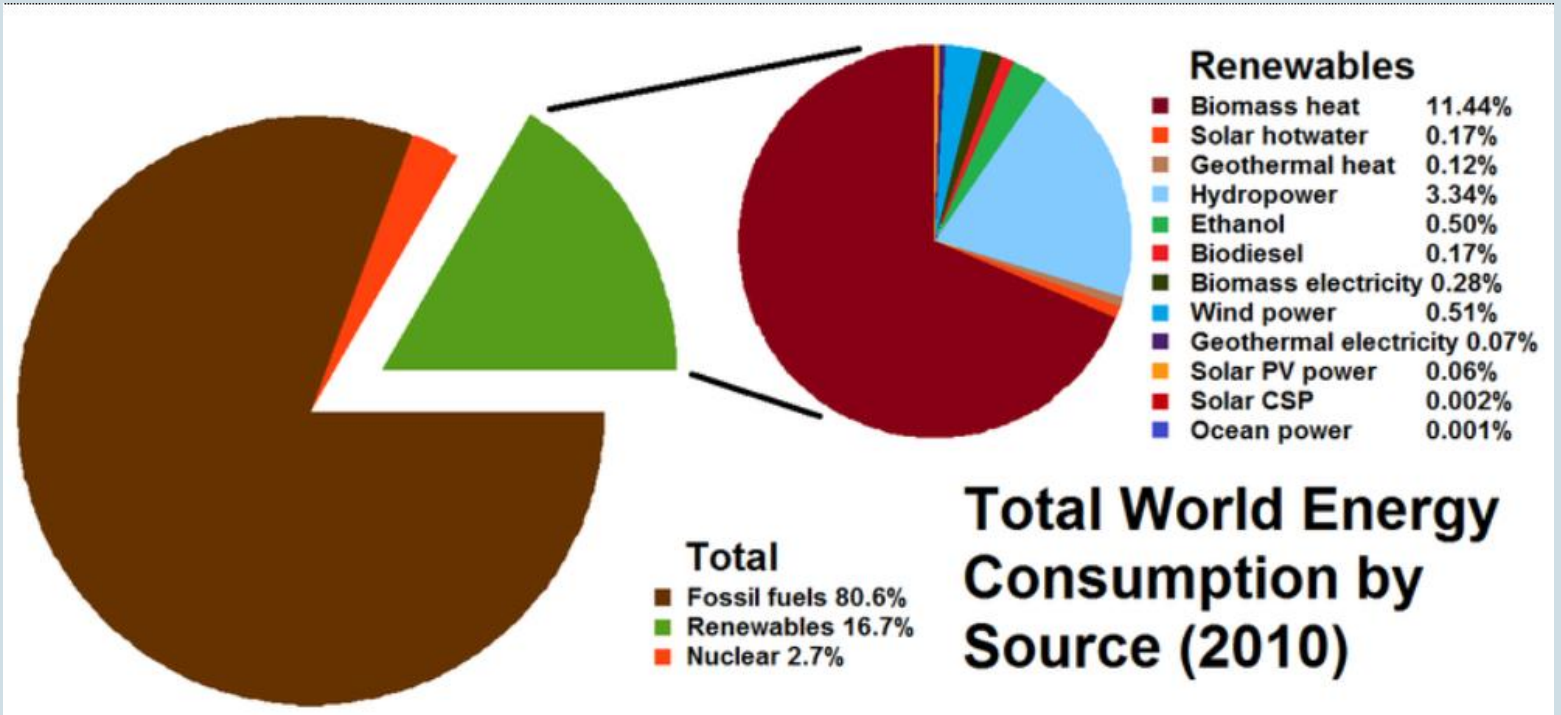
20% – 30%

30% – 40%

40% – 50%

› 50%

World Consumption of Renewable Energy



US Consumption of Renewables

‹ 1%

‹1% – 2%

2% – 5%

5% – 10%

10% – 20%

20% – 30%

30% – 40%

40% – 50%

› 50%

Renewable Energy in U.S.

Electrical Production in U.S. for 2011

Power Source	Plants	Power Capacity (GW)
Coal	589	343.7
Nat Gas	1,687	479.6
Nuclear	66	107
Hydro	1,434	78.2
Other Renewables	1,582	64.3
Petroleum	1,145	57.5
Misc	54	1.7
Storage	40	20.8
Imp-Exp		
Total	6,597	1152.8

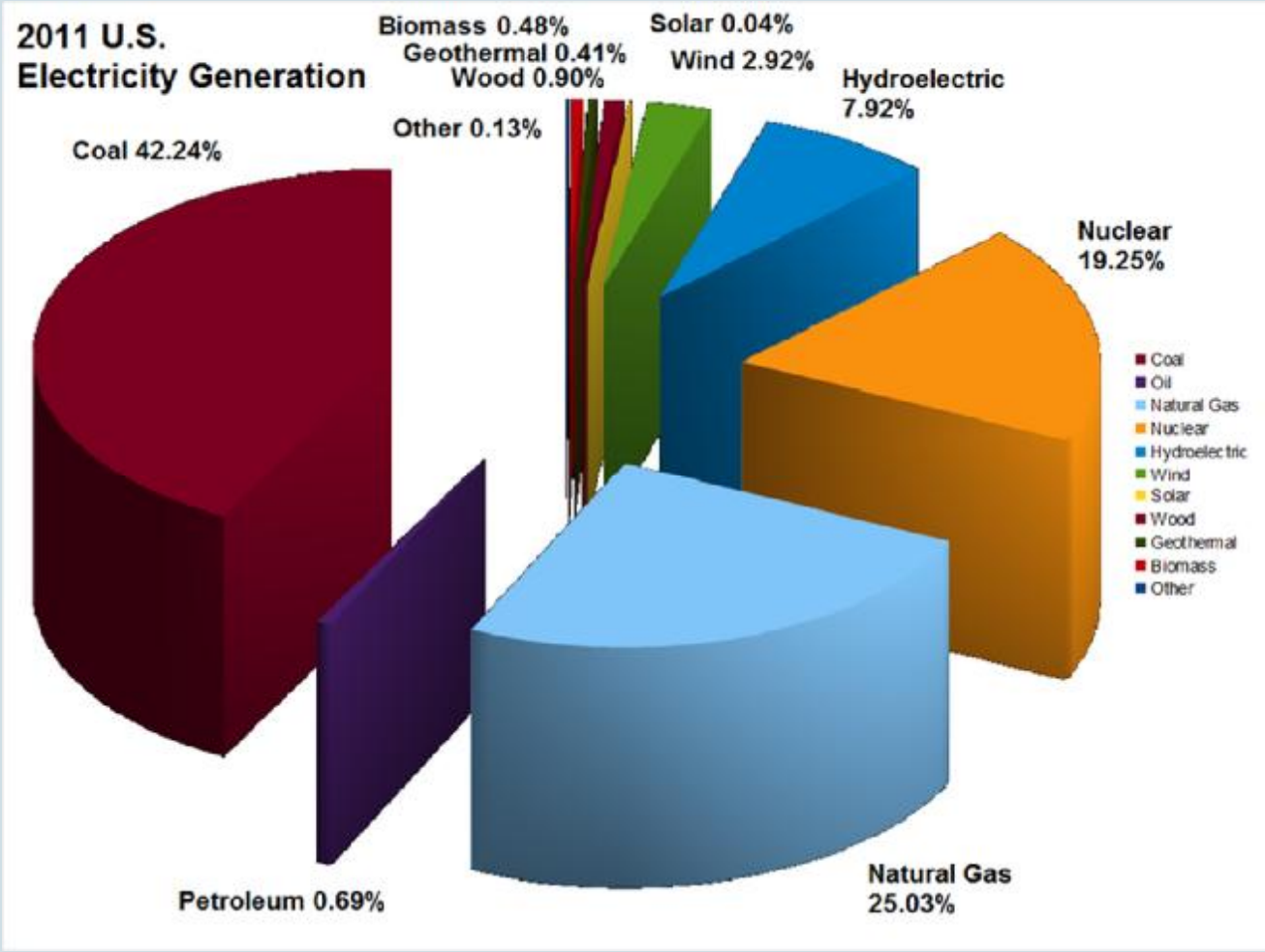
Electrical Production by Renewables in U.S. for 2011

Power Source	Units in Operation	Power Capacity (GW)
Hydro	1,434	78.2
Wind		46
Wood		8
Biomass		5.2
Geothermal		3.5
Solar		1.6
Total	3,016	142.5

Total Electrical Production for 2011: 1152.8 GW

Total Electrical Production by Renewables for 2011: 142.5 GW

In 2011, 12.36% of domestic electrical production was by renewables


2011 U.S.
Electricity Generation
Biomass 0.48%
Geothermal 0.41%
Wood 0.90%
Other 0.13%
Solar 0.04%
Wind 2.92%
Hydroelectric
7.92%
Nuclear
19.25%
Coal 42.24%
Petroleum 0.69%
Natural Gas
25.03%
Coal
Oil
Natural Gas
Nuclear
Hydroelectric
Wind
Solar
Wood
Geothermal
Biomass
Other

Which State Has Most Renewable as % of Total Generation

Idaho	86%
Alaska	20%
South Dakota	59%
Montana	39%
Oregon	66%
Washington	75%

Renewable Energy Production, by State, 2011

State	Energy produced from renewable sources	Renewables, as percent of total electricity generated
Alabama	15,585,230 MWh	11%
Alaska	1,337,282 MWh	20%
Arizona	6,629,666 MWh	6%
Arkansas	5,778,257 MWh	10%
California	53,427,698 MWh	26%
Colorado	5,131,697 MWh	10%
Connecticut	1,268,276 MWh	4%
Delaware	125,611 MWh	3%
District of Columbia	0 MWh	N/A
Florida	4,548,534 MWh	2%
Georgia	6,084,852 MWh	5%

State	Energy produced from renewable sources	Renewables, as percent of total electricity generated
Hawaii	817,484 MWh	7%
Idaho	11,301,580 MWh	86%
Illinois	3,666,132 MWh	2%
Indiana	2,209,306 MWh	2%
Iowa	8,559,766 MWh	17%
Kansas	2,876,065 MWh	6%
Kentucky	3,681,175 MWh	4%
Louisiana	3,600,310 MWh	4%
Maine	8,153,013 MWh	50%
Maryland	2,439,548 MWh	6%
Massachusetts	2,430,334 MWh	6%

Renewable Energy Production, by State, 2011

State	Energy produced from renewable sources	Renewables, as percent of total electricity generated
Michigan	3,995,111 MWh	4%
Minnesota	7,545,745 MWh	14%
Mississippi	1,424,279 MWh	3%
Missouri	2,391,498 MWh	3%
Montana	10,421,506 MWh	39%
Nebraska	882,519 MWh	3%
Nevada	4,269,007 MWh	11%
New Hampshire	2,878,428 MWh	14%
New Jersey	991,912 MWh	2%
New Mexico	1,851,345 MWh	5%
New York	32,082,114 MWh	24%

State	Energy produced from renewable sources	Renewables, as percent of total electricity generated
North Carolina	7,064,661 MWh	6%
North Dakota	4,484,353 MWh	13%
Ohio	1,161,156 MWh	1%
Oklahoma	6,481,846 MWh	9%
Oregon	37,305,940 MWh	66%
Pennsylvania	6,034,794 MWh	3%
Rhode Island	149,336 MWh	2%
South Carolina	4,079,976 MWh	4%
South Dakota	4,859,207 MWh	59%
Tennessee	11,162,430 MWh	14%
Texas	21,675,640 MWh	5%

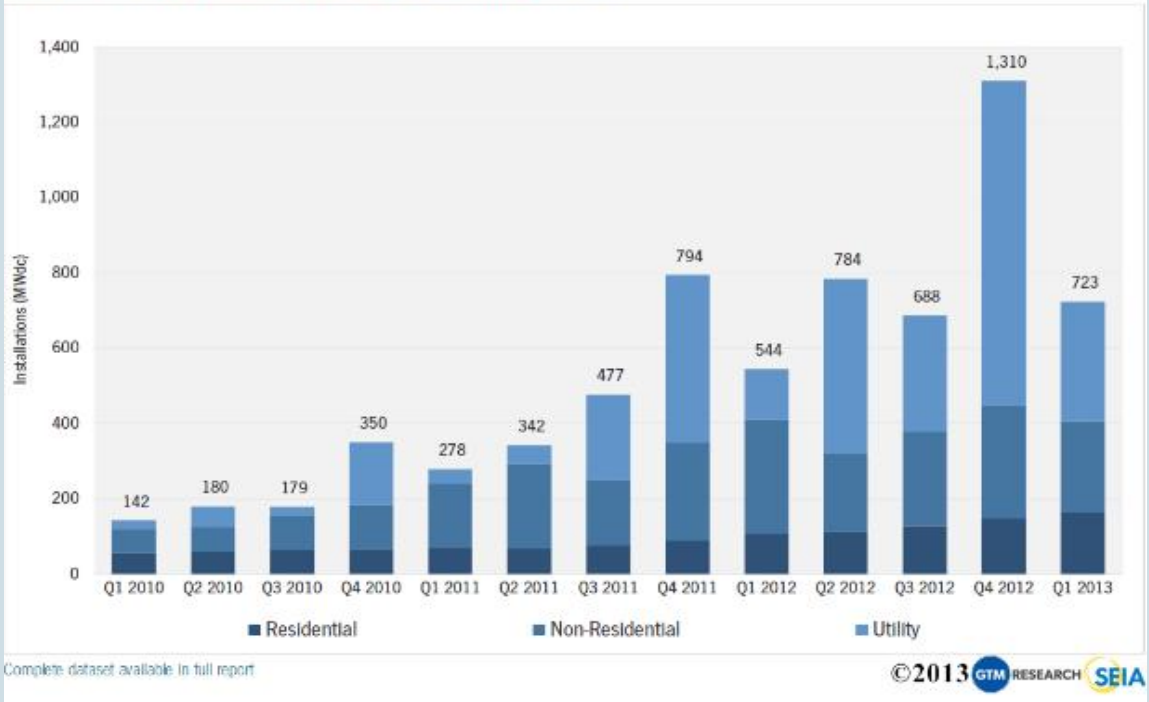
Renewable Energy Production, by State, 2011

State	Energy produced from renewable sources	Renewables, as percent of total electricity generated
Utah	1,321,793 MWh	3%
Vermont	1,914,870 MWh	26%
Virginia	3,896,149 MWh	5%
Washington	77,977,375 MWh	75%
West Virginia	2,387,528 MWh	3%
Wisconsin	3,734,283 MWh	6%
Wyoming	3,192,777 MWh	7%

Solar Energy:

Photovoltaic (PV) installation by Market Segment

Figure 2.1 U.S. PV Installations by Market Segment, Q1 2010-Q1 2013



- From Q4 2012 to Q1 2013, there was a 45% decline
- But market tends to experience a boom in the fourth quarter

Solar Energy:

Photovoltaic (PV) installation Forecast, 2012-2016

Solar Energy:

Photovoltaic (PV) Capacity by State

No	Jurisdiction	2011	2010	2009	2008	2007
1	California	1,563.6	1,021.7	768.0	528.3	328.8
2	New Jersey	565.9	259.9	127.5	70.2	43.6
3	Arizona	397.6	109.8	46.2	25.3	18.9
4	Colorado	196.7	121.1	59.1	35.7	14.6
5	New Mexico	165.5	43.3	2.4	1.0	0.5
6	Pennsylvania	133.1	54.8	7.3	3.9	0.9
7	Nevada	124.1	104.7	36.4	34.2	18.8
8	New York	123.8	55.5	33.9	21.9	15.4
9	Florida	95.0	73.5	38.7	3.0	2.0
10	Texas	85.6	34.5	8.6	4.4	3.2

Geothermal Energy:

Total Capacity, 2012

1.	United States	3,187 MW
2.	Philippines	1,904 MW
3.	Indonesia	1,222 MW
4.	Mexico	958 MW
5.	Italy	883 MW
Total:		11,224.3 MW

Geothermal Energy:

United States

- Led the world in geothermal electricity production in 2012
- About 2,850 MW is available from power plants in Western United States
- In Northern Nevada, geothermal energy generates almost 10% of its electricity

Wind Energy

- The fastest growing source of electricity in the world
- ≈45,000 MW in 2012

Question

- Which country has the most wind?

Total Wind Capacity, 2012

1.	China	75,564 MW
2.	United States	60,007 MW
3.	Germany	31, 332 MW
4.	Spain	22,796 MW
5.	India	19,051 MW
	Total worldwide	282,482 MW

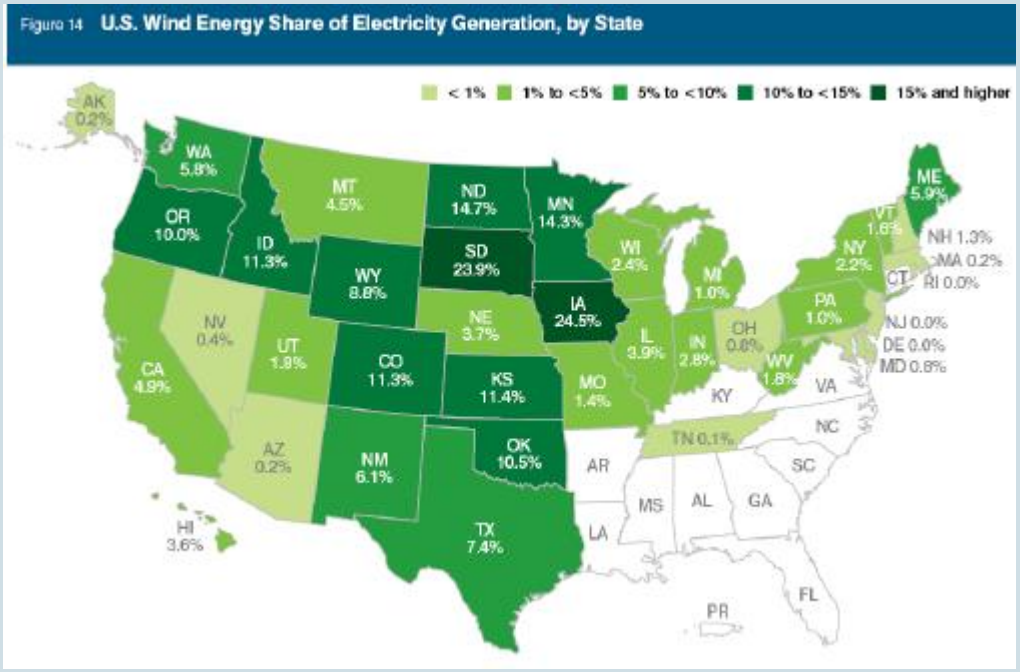
Total Electrical Power Generation in the United States, 2012

- Total electrical power: 4,054 TWh
- Total wind power: 140.27 TWh (3.46%)
- Total solar power: 4.45 TWh (0.11%)

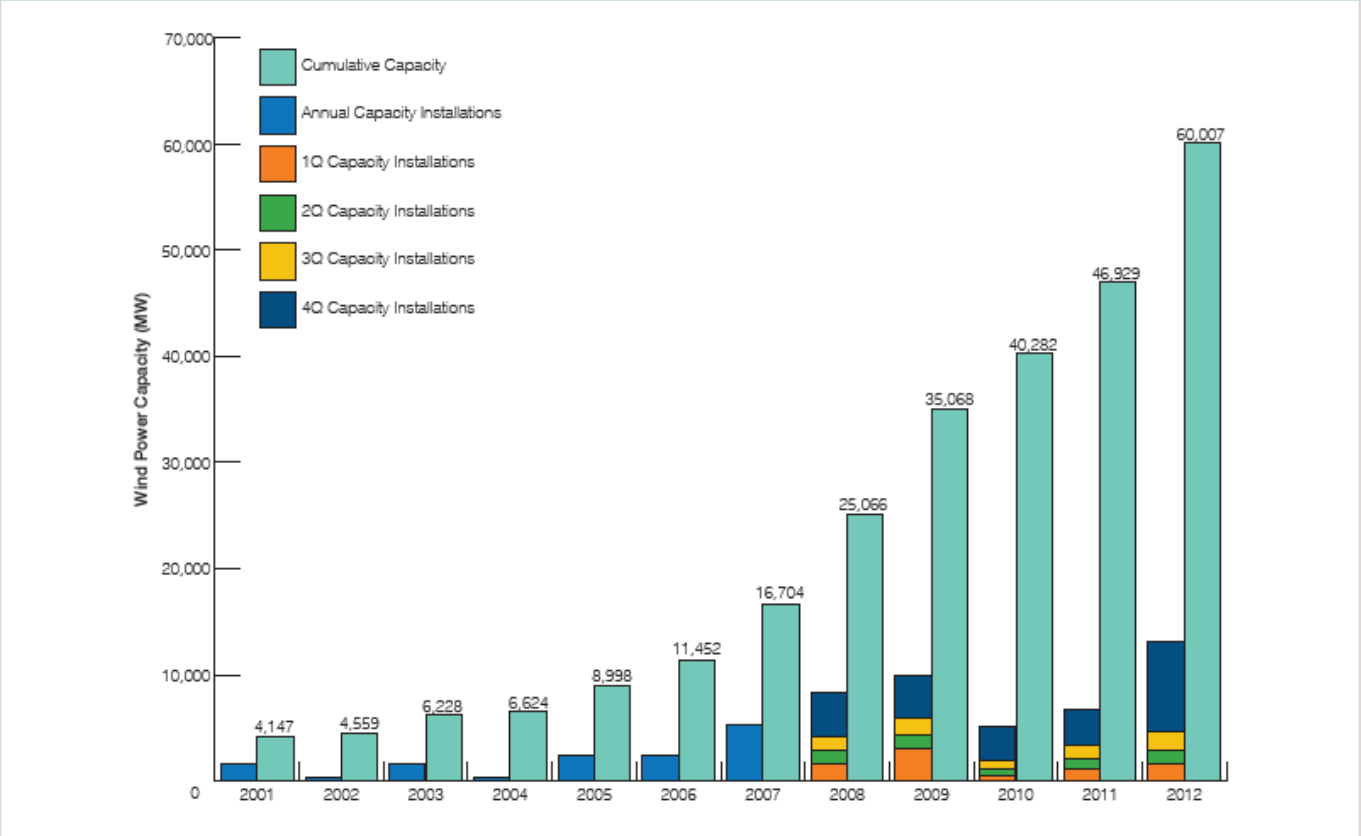
Wind Share of Total Electricity Generated by State, 2012

1. Iowa 24.5% from wind
2. South Dakota 23.9% from wind
3. North Dakota 14.7% from wind
4. Minnesota 14.3% from wind
5. Kansas 11.4% from wind

Wind Share of Total Electricity Generated by State, 2012



Total Wind Capacity in U.S., 2012



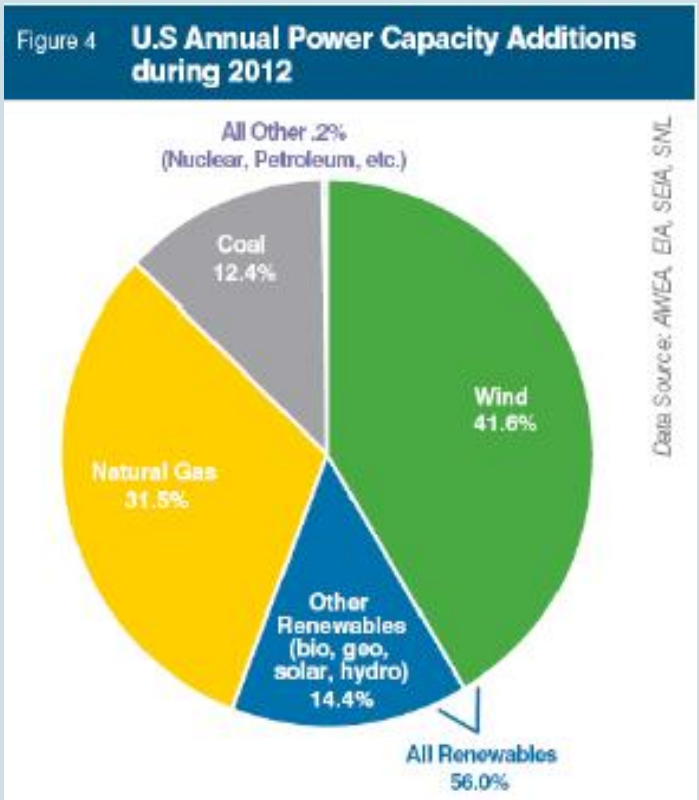
New Wind Capacity in the U.S.

New Capacity in 2008:	8,361 MW
New Capacity in 2009:	10,000 MW
New Capacity in 2010:	5,214 MW
New Capacity in 2011:	6,819 MW
New Capacity in 2012:	13,131 MW (28% growth)

Total by end of 2012: 60,007 MW

(Enough to power 15 million homes)

New Wind Capacity in the U.S.

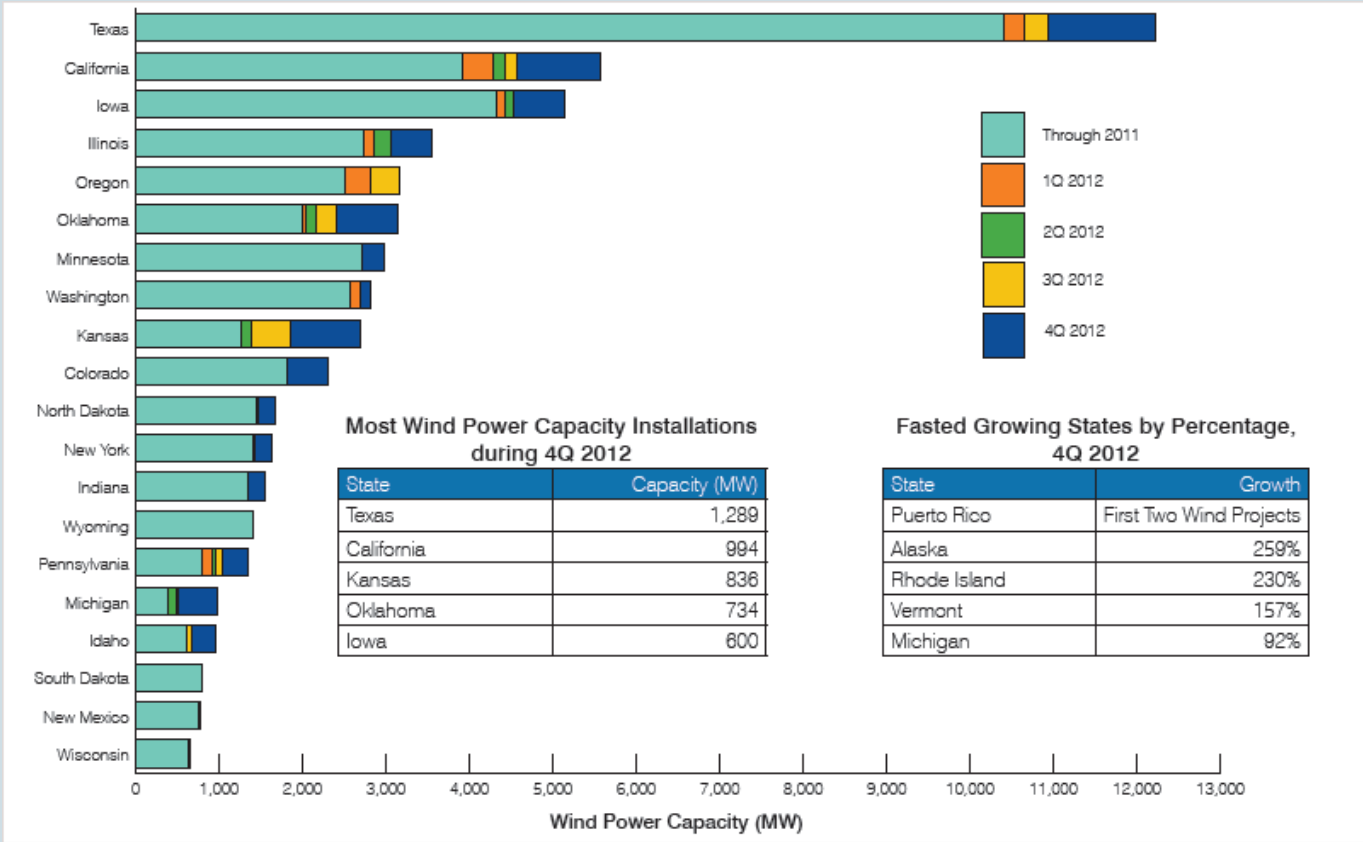


Wind generated 41.6% of all newly generated power capacity during 2012

Question

- Which state has the most wind?

New Wind Capacity by State, 2012



Most Wind Power Capacity Installations during 4Q 2012

State	Capacity (MW)
Texas	1,289
California	994
Kansas	836
Oklahoma	734
Iowa	600

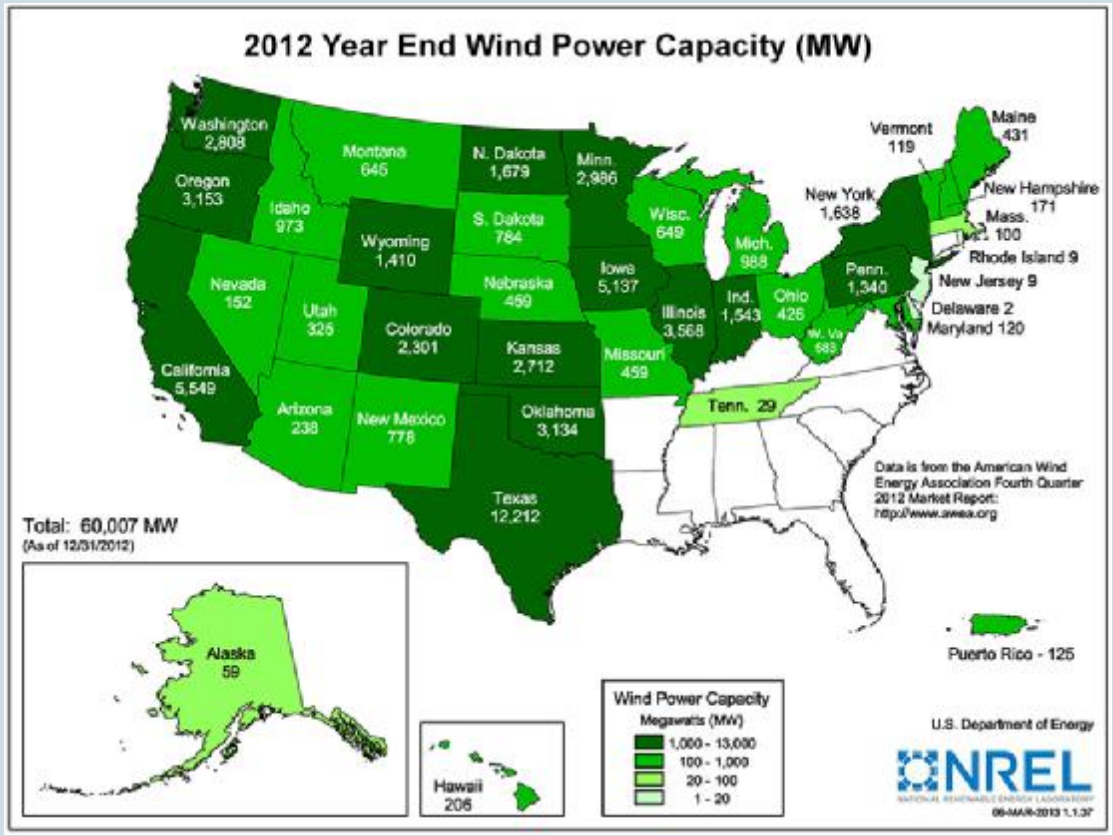
Fasted Growing States by Percentage, 4Q 2012

State	Growth
Puerto Rico	First Two Wind Projects
Alaska	259%
Rhode Island	230%
Vermont	157%
Michigan	92%

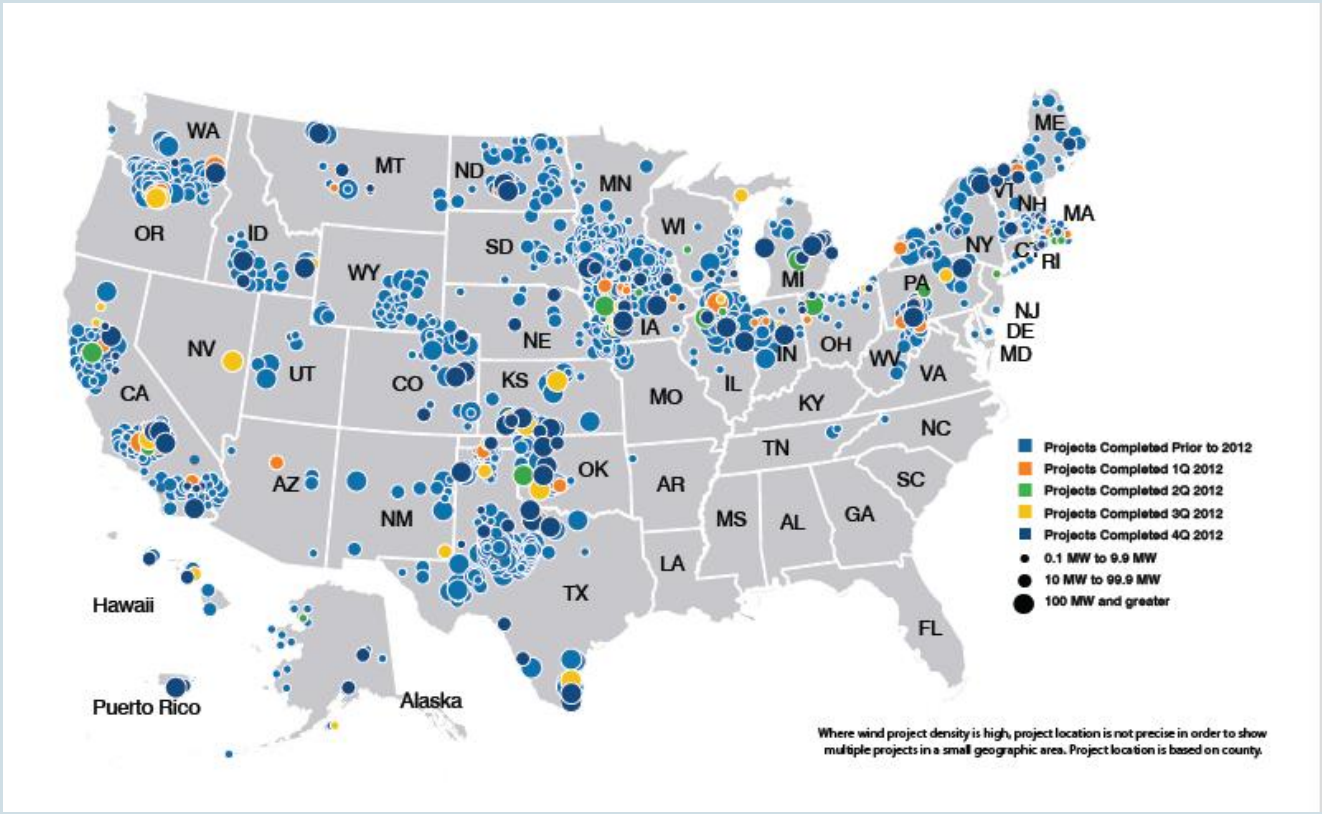
Total Wind Capacity by State, 2012

1.	Texas	12,214 MW
2.	California	5,544 MW
3.	Iowa	5,133 MW
4.	Illinois	3,568 MW
5.	Oregon	3,153 MW

Total Wind Capacity by State, 2012



Wind Project Locations, 2012



New Wind Capacity by State, 2012

1.	Texas	1,826 MW
2.	California	1,656 MW
3.	Kansas	1,441 MW
4.	Oklahoma	1,127 MW
5.	Illinois	823 MW
	Total	13,131 MW

New Wind Capacity by State, 2012

While Texas ranked first in total wind capacity installed, and Iowa ranked first in wind generation during 2012, other states rise through the ranks in other metrics.

North Dakota ranked highest in wind power installed per capita, followed by Wyoming, Iowa, South Dakota and Kansas.

Iowa ranked first capacity per square mile, followed by Illinois, Texas, Oklahoma and Indiana.

Figure 67 **Top 20 U.S Wind Power State Rankings**

Find More Information in the Report:

- State rankings for total and new wind capacity;
- New wind capacity by state by quarter;
- Map of all wind power projects;
- Regional market share for new wind capacity;

U.S. Wind Turbine Installation

- 3,500 installed in 2011
- 6,700 installed in 2012
  - Average size of wind turbine installed: 1.95 MW
  - Each wind turbine installed generates an average of 4.68 to 7.8 million kWH annually
  - Enough electricity to power 468 to 780 households each
- 45,100 total by the end of 2012
  - Across 890 wind projects
  - 95% of wind turbines are installed on private land

Prior to 2000

- Every major wind turbine manufactured in the world (except one) filed for bankruptcy

What Changed?

- Computing power
- Materials
- Policies/Incentives
- LIDAR (Light Detection and Ranging)
- SODAR (Sonic Detention and Ranging)

Policies/ Incentives

- State sales tax exemptions
- Renewable Portfolio Standards (RPS)
- Production Tax Credits (PTC)
- Investment Tax Credit (ITC)

Renewable Portfolio Standard (RPS) by State

State	Target	Year	Other facts	Applicability
AZ	15%	2025		Investor-owned utilities (IOUs), rural electric cooperatives, retail suppliers
CA	33%	2020	20% by 2013 25% by 2016	IOUs, electric service providers, community choice aggregators
CO	30%	2020		IOUs
	20%	2020		Electric cooperatives serving at least 100,000 meters
	10%	2020		Electric cooperatives serving fewer than 100,000 meters; municipal utilities serving more than 40,000 customers
CT	27%	2020	16% by 2012 19.5% by 2015	IOUs, municipal utilities, retail supplier
DC	20%	2020		IOUs, retail supplier
DE	25%	2025	8.5% by 2012 20% by 2019	IOUs, municipal utilities, rural electric cooperatives, retail suppliers
HI	40%	2030	10% by 2011 15% by 2015 25% by 2020	IOUs, rural electric cooperatives

Renewable Portfolio Standard (RPS) by State

State	Target	Year	Other facts	Applicability
IL	25%	2025		IOUs, retail suppliers
KS	20%	2020	10% by 2011 15% by 2016	IOUs, rural electric cooperatives
MA	15%	2020	For Class I	IOUs, retail suppliers
	7.1%	2009	For class II	
	5%	2020	For alternative energy	
MD	20%	2022		IOUs, municipal utilities, rural electric cooperatives, retail suppliers
ME	40%	2017	For class II	IOUs, retail suppliers
	10%	2017	For class I	
MI	10%	2015		IOUs, municipal utilities, rural electric cooperatives, retail suppliers
MN	25%	2025	12% by 2013 17% by 2017	IOUs, municipal utilities, rural electric cooperatives
	30%	2020	15% by 2011 18% by 2013	Excel Energy
MO	15%	2021		IOUs
MT	15%	2015	5% by 2008 10% by 2010	IOUs, retail suppliers

Renewable Portfolio Standard (RPS) by State

State	Target	Year	Other facts	Applicability
NC	12.5%	2021	3% by 2012 6% by 2015 10% by 2018	IOUs
	10%	2018		Electric cooperatives, municipal utilities
NH	24.8%	2025		IOUs, rural electric cooperatives, retail suppliers
NJ	20.38%	2020	For class I and II	IOUs, retail suppliers
	4.1%	2027	For solar-electric	
NM	20%	2020	5% by 2006 10% by 2011 15% by 2015	IOUs
	10%	2020		Rural electric cooperatives
NV	25%	2025	6% by 2005 20% by 2015 22% by 2020	IOUs, retail suppliers
NY	30%	2015		IOUs Exception: Long Island Power Authority

Renewable Portfolio Standard (RPS) by State

State	Target	Year	Other facts	Applicability
OH	25%	2025		IOUs, retail suppliers
OR	25%	2025	For large utilities	IOUs, municipal utilities, rural electric cooperatives, retail suppliers
	10%	2025	For small utilities	
	5%	2025	For smallest utilities	
PA	18%	2020		IOUs, retail suppliers
RI	16%	2019	6.5% by 2012	IOUs, retail suppliers
WA	15%	2020	3% by 2012 9% by 2016	IOUs, municipal utilities, rural electric cooperatives
WI	10%	2015		IOUs, municipal utilities, rural electric cooperatives
WV	25%	2025	10% by 2015 15% by 2020	IOUs, retail suppliers serving more than 30,000 customers

Investment Tax Credit

- BC in 2013
- 30% lump sum credit at C.O.
- Monetize to tax investor

Production Tax Credit BC in 2013

- 2.3¢/kwh for 10 years
- ≈ $1-2 m/tb
- Monetize to tax investor
- Flip Structure

Typical Development Cycle

- Land acquisition
- Wind assessment
- Environmental studies/ permitting
- Power Purchase Agreement
- Interconnection Agreement
- Financing
- Turbine Supply Agreement
- Service and Maintenance
- Engineering, procurement and construction (EPC)
- Construction/ Commercial Operation

Players (Onshore)

- GE (1.5, 1.6, 1.68)
- SIEMENS (2.3, 3.0)
- VESTAS (1.8, 2.0, 2.6, 3.0)
- MITSUBISHI (1.0, 2.4)
- SUZLON (1.25, 1.5, 2.1)
- GAMESA (2.0, 4.5/120HH)
- CLIPPER (2.5)
- REPOWER (1.8, 2.05, 3.2, 3.4)
- DEWIND (1.25, 2.0)
- ALSTOM (ECOTECNIA) (3.0)
- ACCIONA (1.5, 3.0)
- ENERCON (2.3, 3.0, 7.5-135HH, 126RD)
- FUHRLANDER (1.5, 2.5)
- GUOIDIAN UNITED POWER (1.5)
- GOLDWIND (1.5, 2.5)
- SANY (2.0)
- SINOVAL (FUHRLANDER) (1.5, 3.0)
- MINGYANG (1.5, 2.5)
- DONGFANG ELECTRIC
- SAMSUNG (2.5)

Players (Offshore)

- SIEMENS (3.6)
- VESTAS (3.0, 7.0)
- GE (4.0, 10-15)
- AREVA (5.0 multibrid)
- X EMC (Danwind) (5.0)
- REPOWER (5.0, 6.15)
- GAMESA (5.0, 6/7.0)
- DONGFANG (3.0, 5.0)
- GOLDWIND (6.0)

Turbine Basics

- Towers 200 – 300 ft
- Blades 100 – 150 ft
- RPM 8 – 24
- Tip speed up to 300 mph

Turbine Basics, Continued

• Typical	1.5MW
• Rotor	24 T
• Nacelle	70 T
• Foundation	30 T rebar
	250 yards, concrete
	50 ft diameter
	8 ft thick

Midwest – 1.5 mW Blade

Prince – Sault Ste. Marie - Ontario

Space Ship Once - Mojave

World's Largest Wind Turbine: Enercon E-126; 7.5 MW

- 650 ft tall
- 413 ft rotor diameter
- At least 5 companies are working on the development of a 10 MW turbine

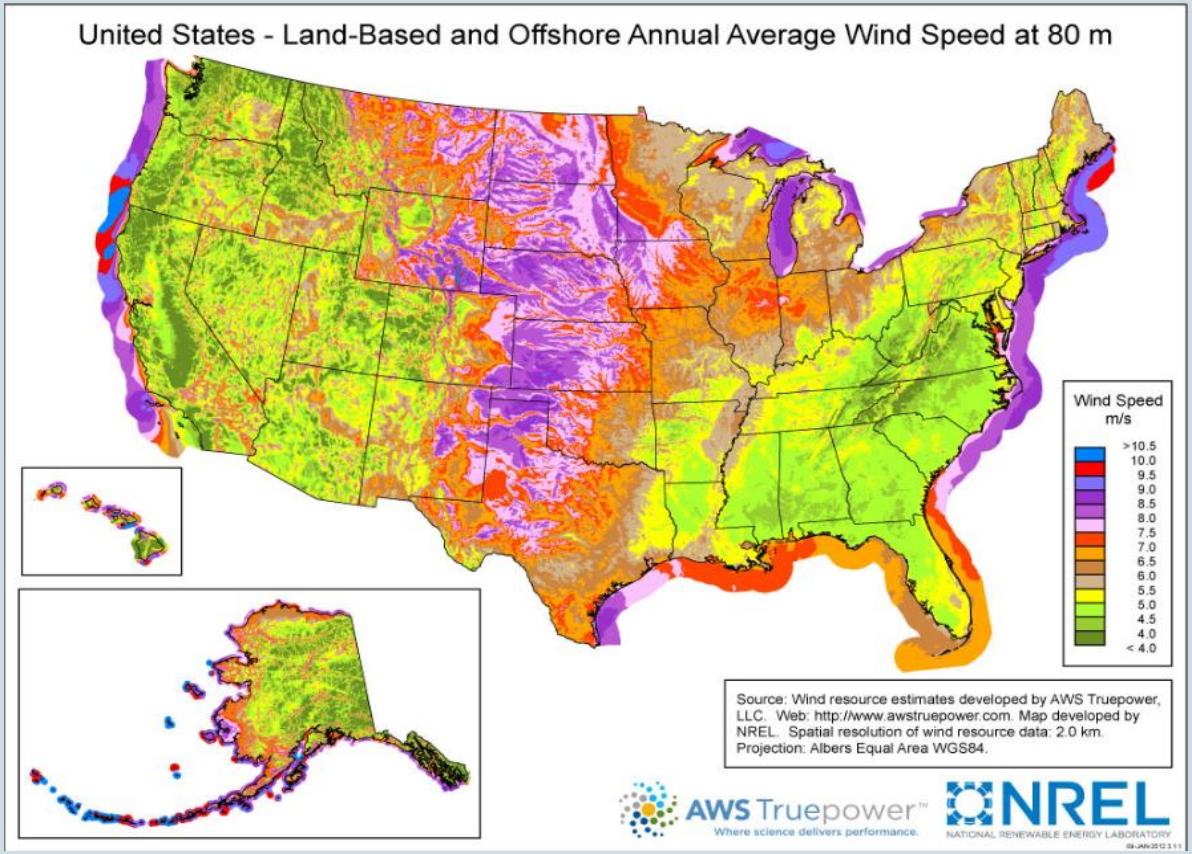
Washington Record

- In one day in February of this year, the energy from three Puget Sound Energy wind farms in Eastern Washington powered 1.1 million customers on the west side of the Cascades
- 23.5% of all Puget Sound Energy electricity used that day

Wild Horse Wind Farm
Eastern Washington

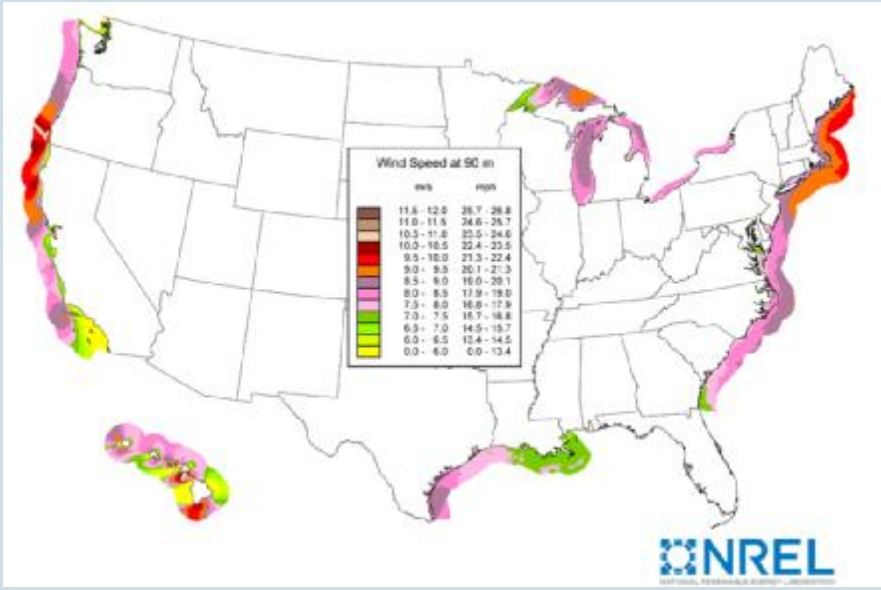
FUTURE

Wind Resource Potential in U.S.



Wind Resource Potential in U.S.

- Wind potential onshore: 10,400,000 MW
- Wind potential offshore: 4,150,000 MW



Global Wind Resource Potential

- In 2010, a total of 3.16 GW of offshore wind capacity was operational, mainly in Northern Europe
- By 2020, offshore wind power capacity is expected to reach a total of 75 GW

- Energy Management
- Storage
- Energy Efficiency

Energy Efficiency Negawatts

- 75% Buildings
- Restructure Incentives
- 20 year payout
- ≈ 30 Billion /year capital investment

QUESTIONS?

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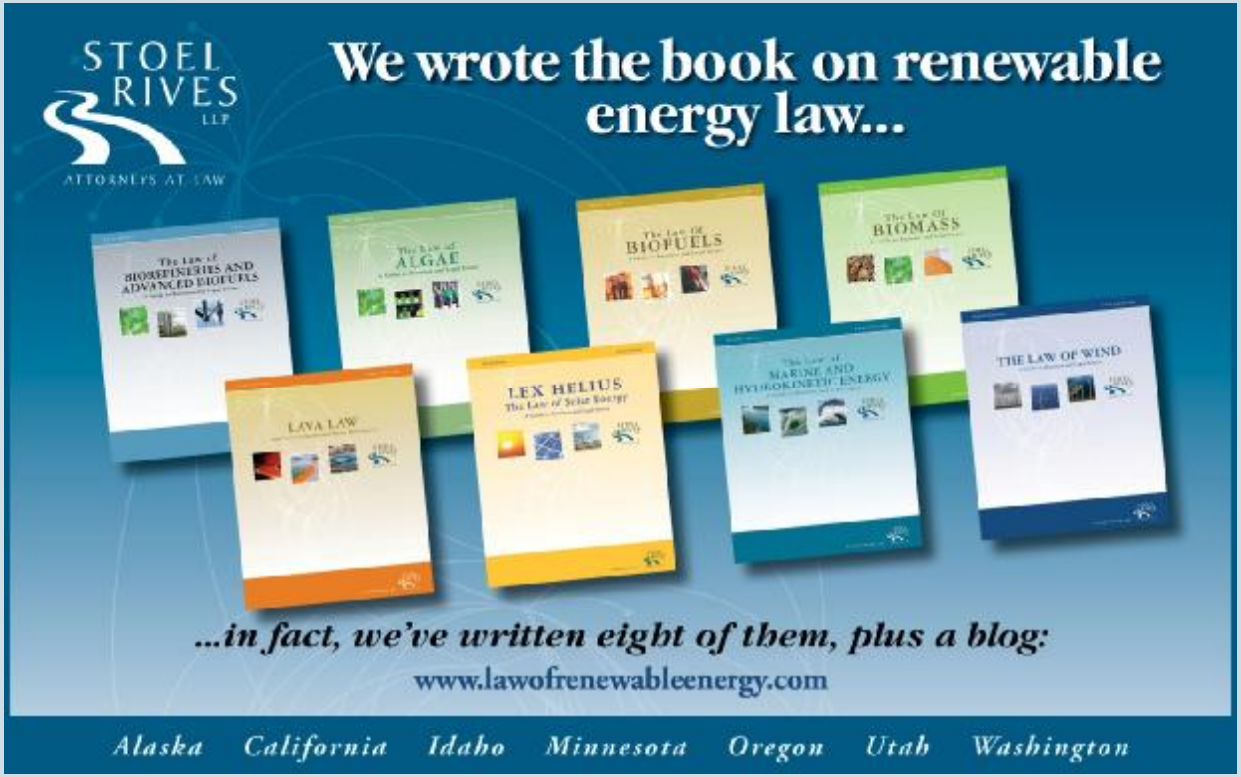

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