Wind Energy Update
Indiana Wind Working Group Meeting #2

Ryan Brown

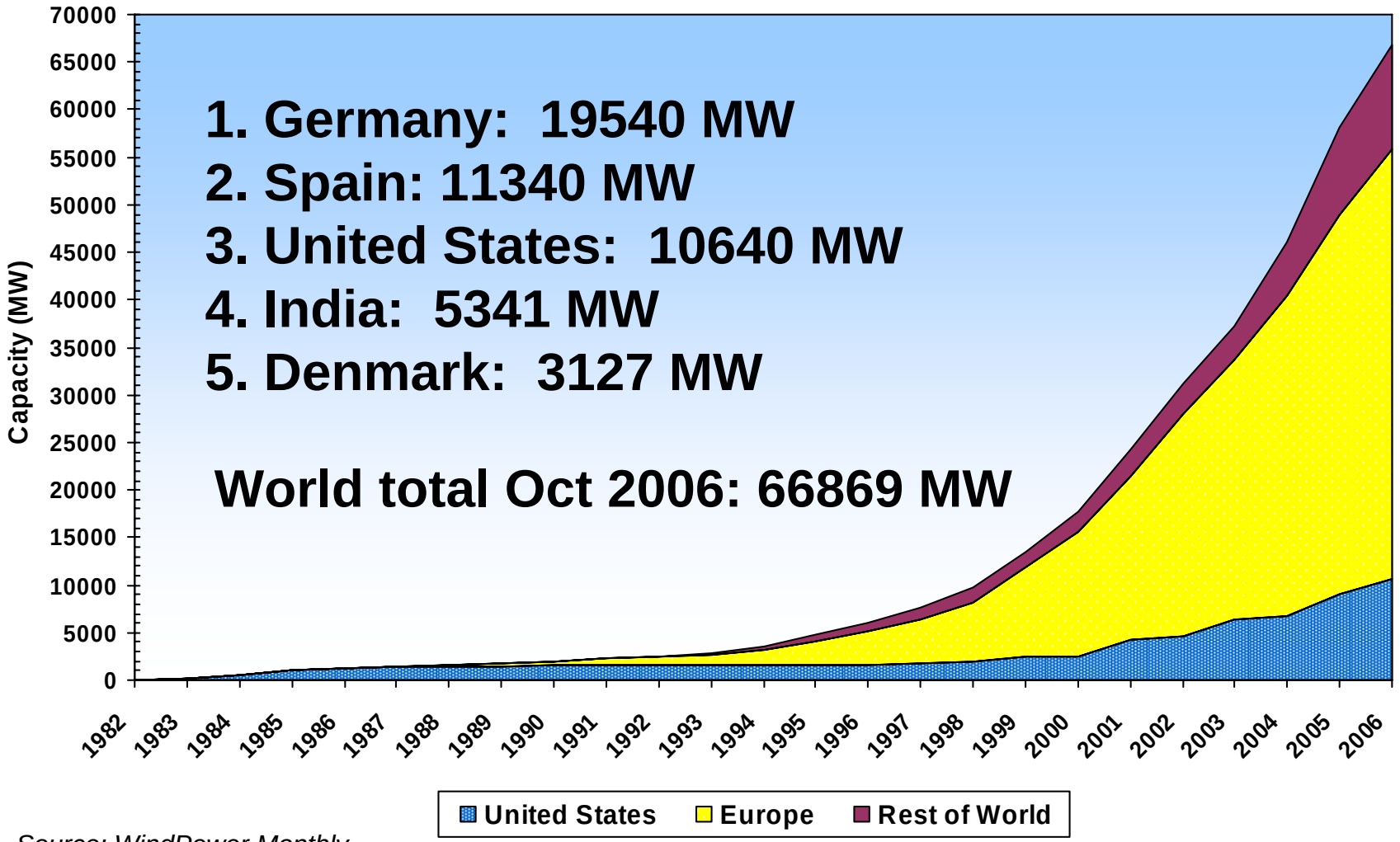
Indiana Office of Energy & Defense Development

December 21, 2006

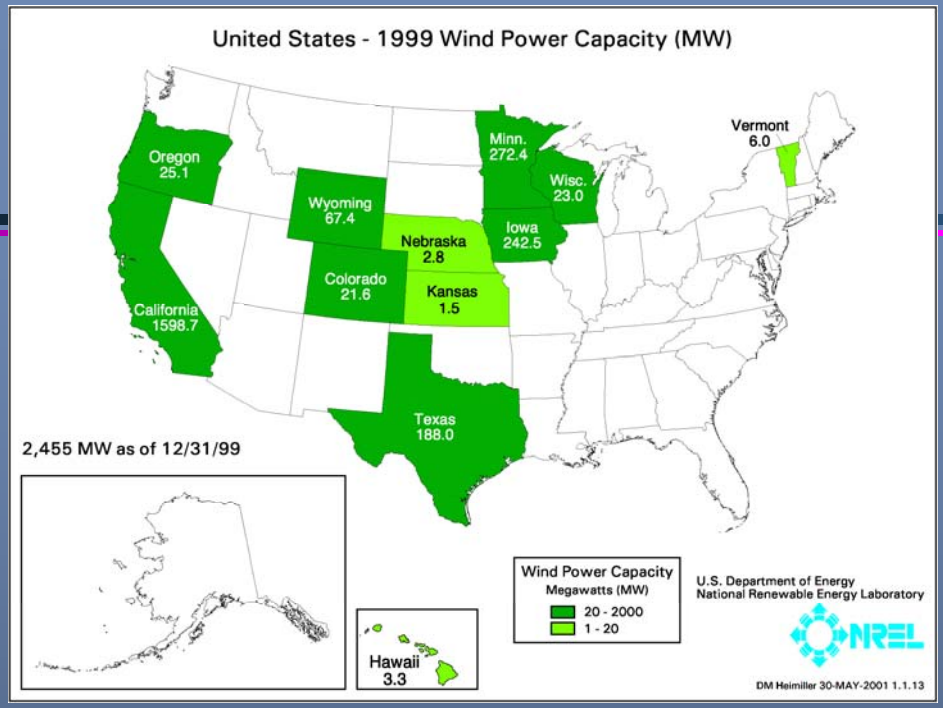
Indianapolis, IN

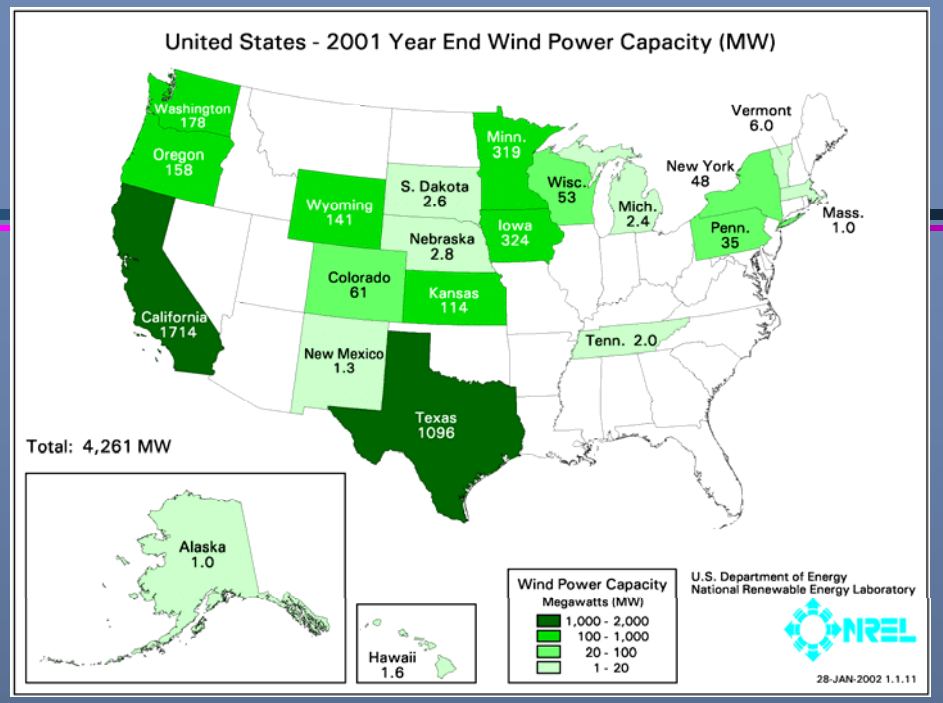
People Want Renewable Energy!

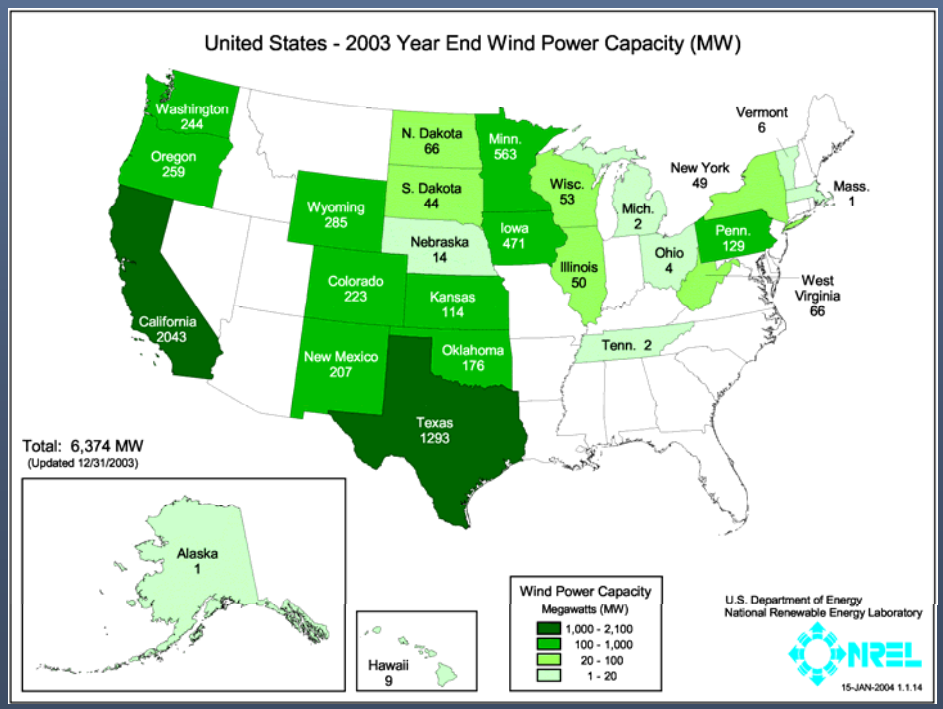
Total Installed Wind Capacity

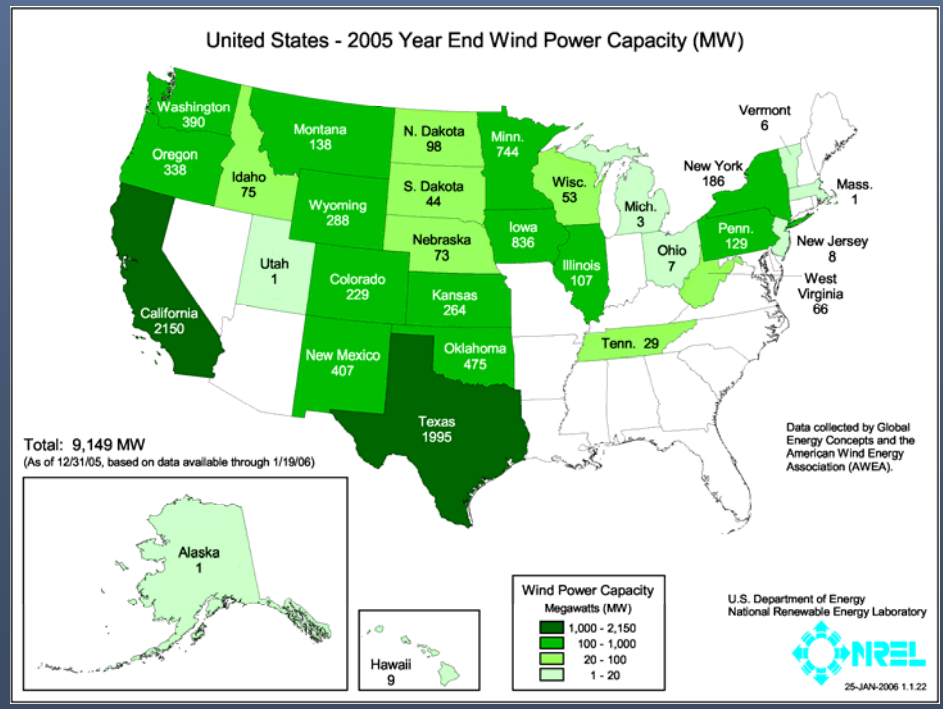


Source: WindPower Monthly

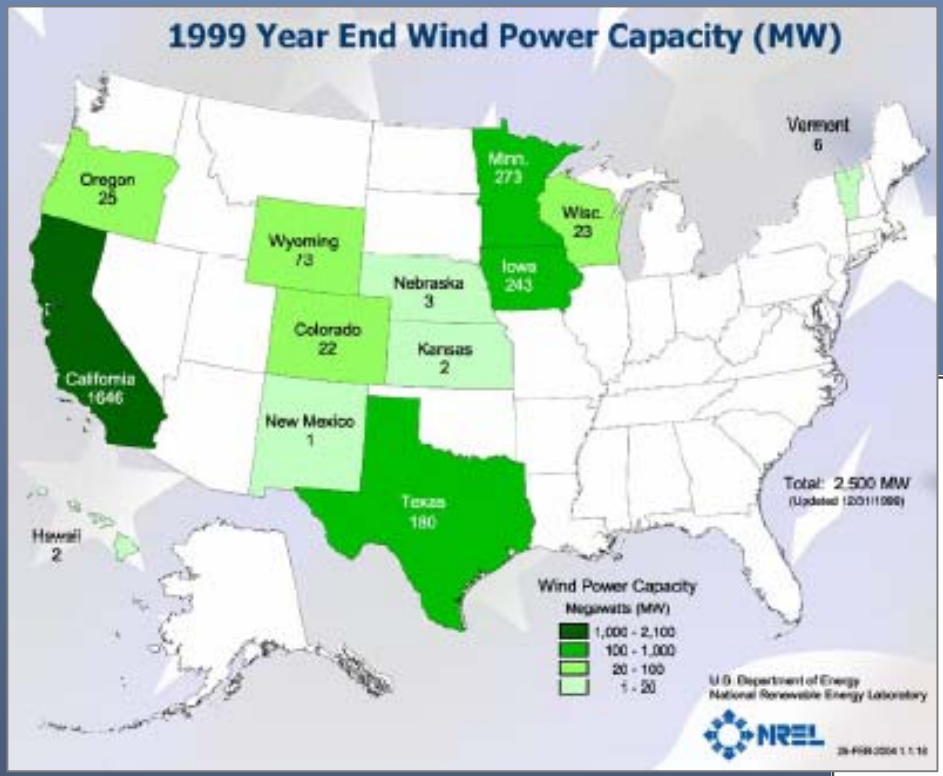

United States - 1999 Wind Power Capacity (MW)
Oregon 25.1
California 1598.7
Wyoming 67.4
Nebraska 2.8
Colorado 21.6
Kansas 1.5
Texas 188.0
Minn. 272.4
Wisc. 23.0
Iowa 242.5
Vermont 6.0
2,455 MW as of 12/31/99
Alaska
Hawaii 3.3
Wind Power Capacity
Megawatts (MW)
20 - 2000
1 - 20
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
DM Heimiller 30-MAY-2001 1.1.13

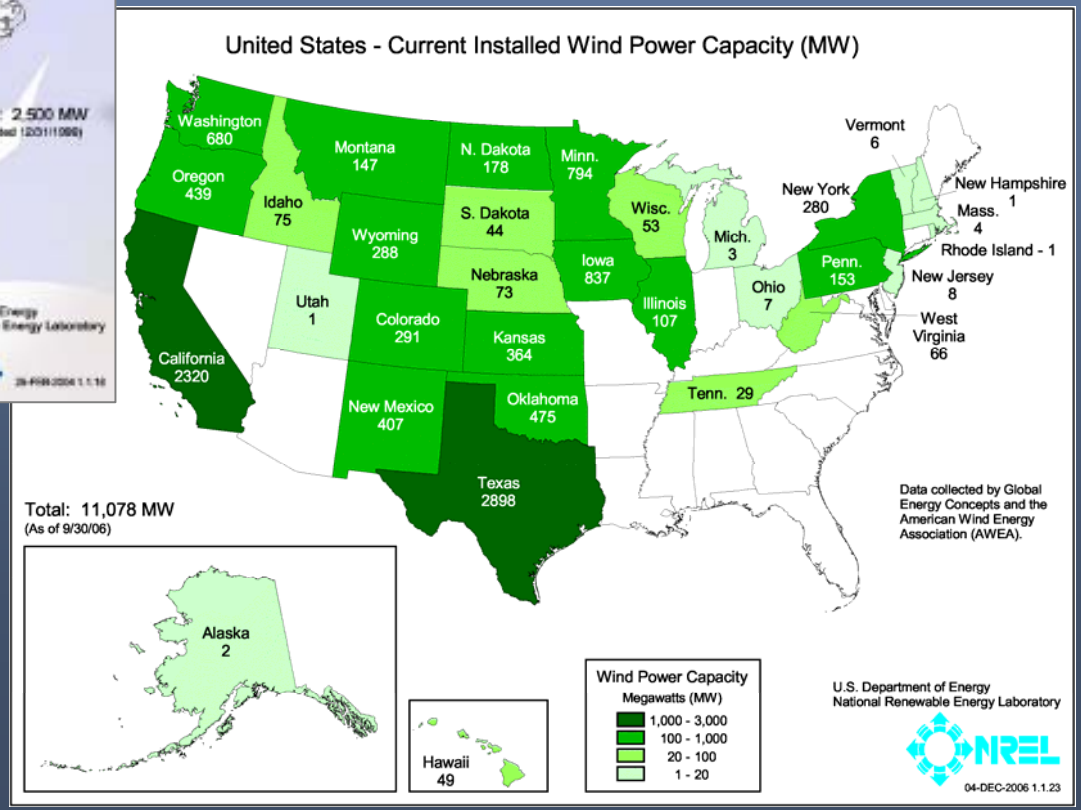

United States - 2001 Year End Wind Power Capacity (MW)
Washington 178
Oregon 158
California 1714
Wyoming 141
S. Dakota 2.6
Nebraska 2.8
Colorado 61
Kansas 114
New Mexico 1.3
Texas 1096
Minn. 319
Iowa 324
Wisc. 53
Mich. 2.4
Vermont 6.0
New York 48
Penn. 35
Mass. 1.0
Tenn. 2.0
Total: 4,261 MW
Alaska 1.0
Hawaii 1.6
Wind Power Capacity
Megawatts (MW)
1,000 - 2,000
100 - 1,000
20 - 100
1 - 20
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
28-JAN-2002 1.1.11


United States - 2003 Year End Wind Power Capacity (MW)
Washington 244
Oregon 259
California 2043
Wyoming 285
N. Dakota 66
S. Dakota 44
Nebraska 14
Colorado 223
Kansas 114
New Mexico 207
Oklahoma 176
Texas 1293
Minn. 563
Iowa 471
Wisc. 53
Illinois 50
Mich. 2
Ohio 4
Tenn. 2
New York 49
Penn. 129
Vermont 6
Mass. 1
West Virginia 66
Total: 6,374 MW
(Updated 12/31/2003)
Alaska 1
Hawaii 9
Wind Power Capacity
Megawatts (MW)
1,000 - 2,100
100 - 1,000
20 - 100
1 - 20
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
15-JAN-2004 1.1.14

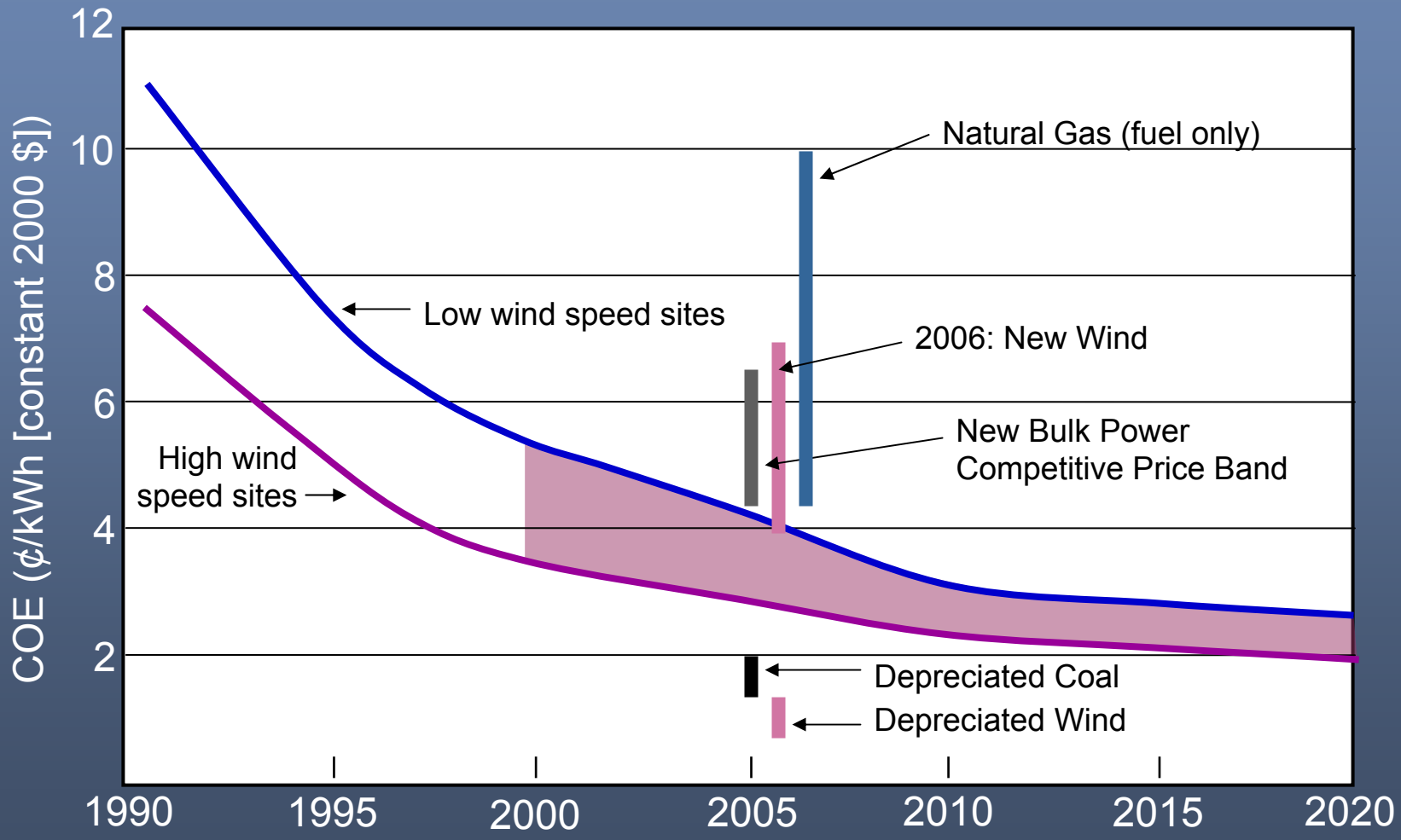

United States - 2005 Year End Wind Power Capacity (MW)
Washington 390
Oregon 338
California 2150
Idaho 75
Utah 1
Montana 138
Wyoming 288
N. Dakota 98
S. Dakota 44
Nebraska 73
Colorado 229
Kansas 264
New Mexico 407
Oklahoma 475
Texas 1995
Minn. 744
Iowa 836
Wisc. 53
Illinois 107
Mich. 3
Ohio 7
Tenn. 29
New York 186
Penn. 129
Vermont 6
Mass. 1
New Jersey 8
West Virginia 66
Total: 9,149 MW
(As of 12/31/05, based on data available through 1/19/06)
Data collected by Global Energy Concepts and the American Wind Energy Association (AWEA).
Alaska 1
Hawaii 9
Wind Power Capacity
Megawatts (MW)
1,000 - 2,150
100 - 1,000
20 - 100
1 - 20
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
25-JAN-2006 1.1.22

Installed Wind Capacities (99-05)

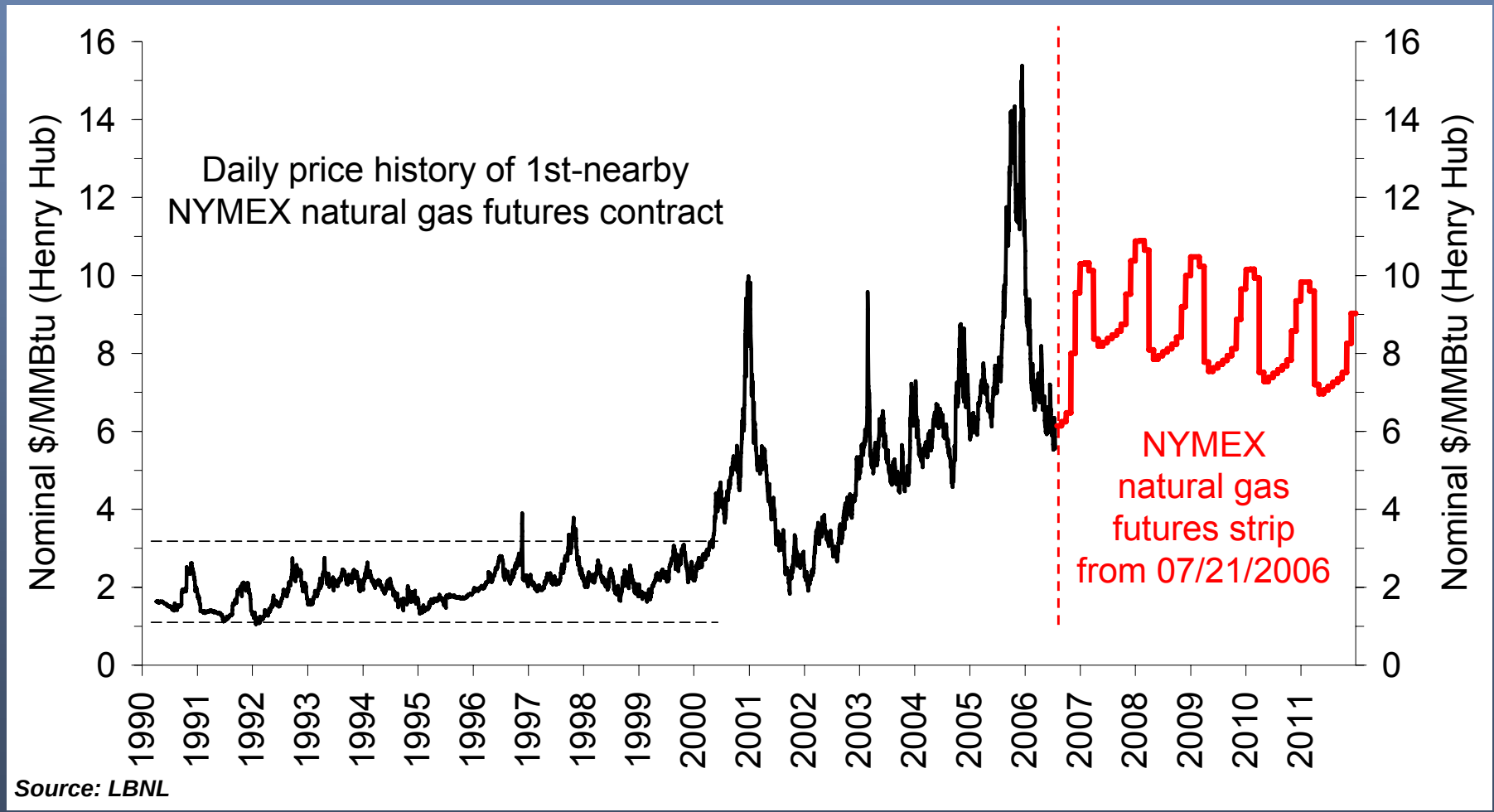




Wind Cost of Energy

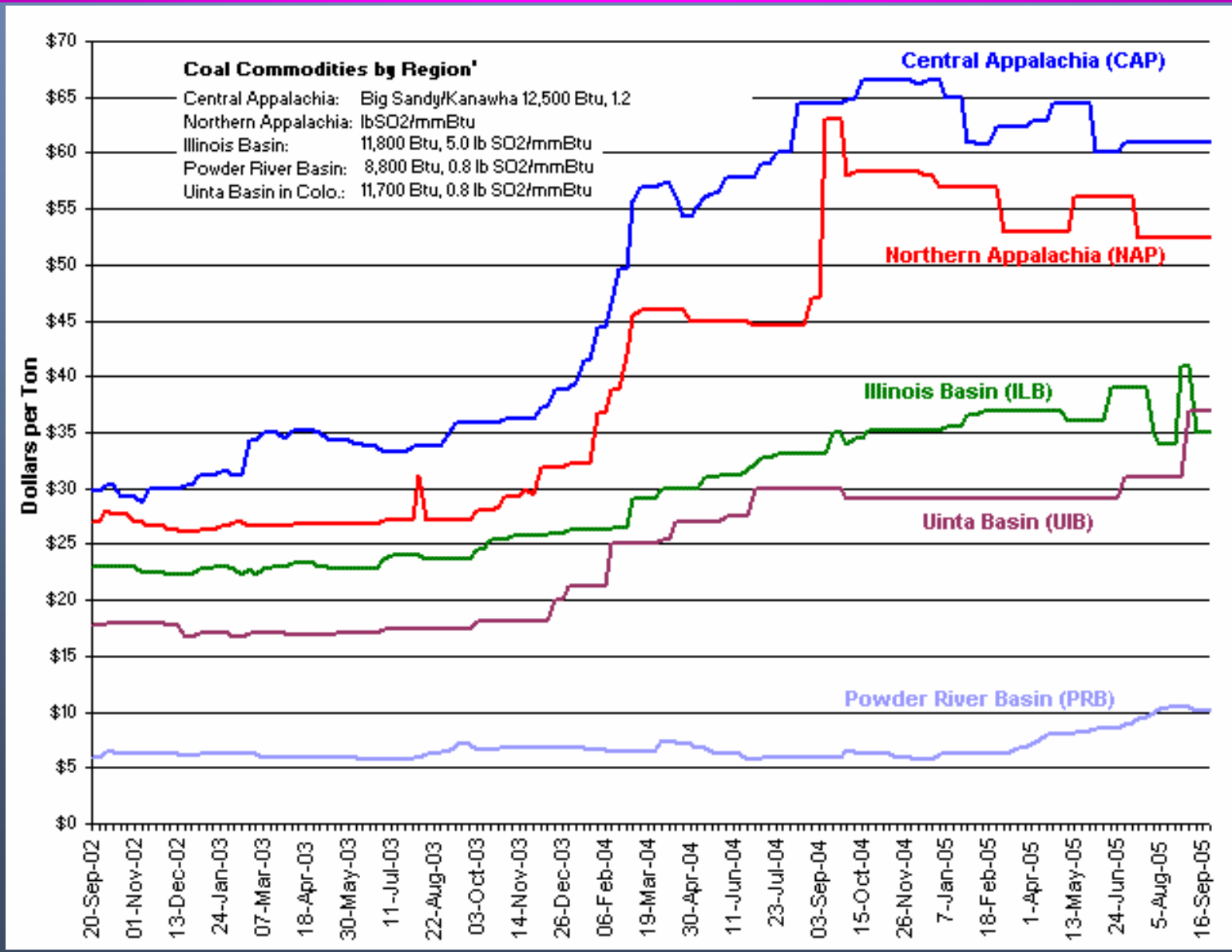


Natural Gas – Historic Prices



Source: LBNL

Historical Coal Prices

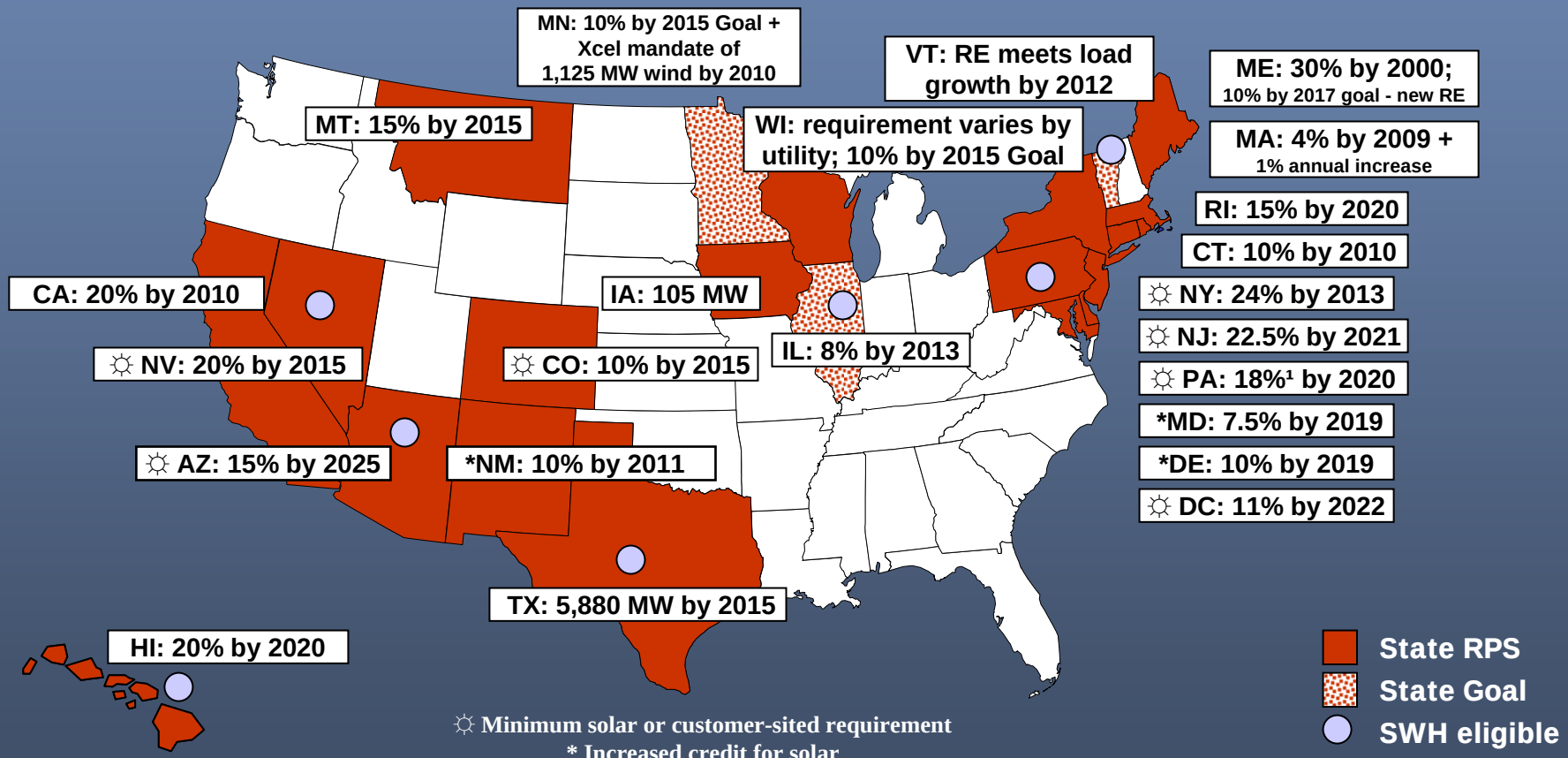


Wind Energy Investors

SIEMENS

Goldman Sachs

Renewables Portfolio Standards



☼ Minimum solar or customer-sited requirement
* Increased credit for solar
[1]PA: 8% Tier I, 10% Tier II (includes non-renewable sources)

DSIRE: www.dsireusa.org

October 2006

Environmental Benefits

- No SOx or NOx
- No particulates
- No mercury
- No CO2
- No water

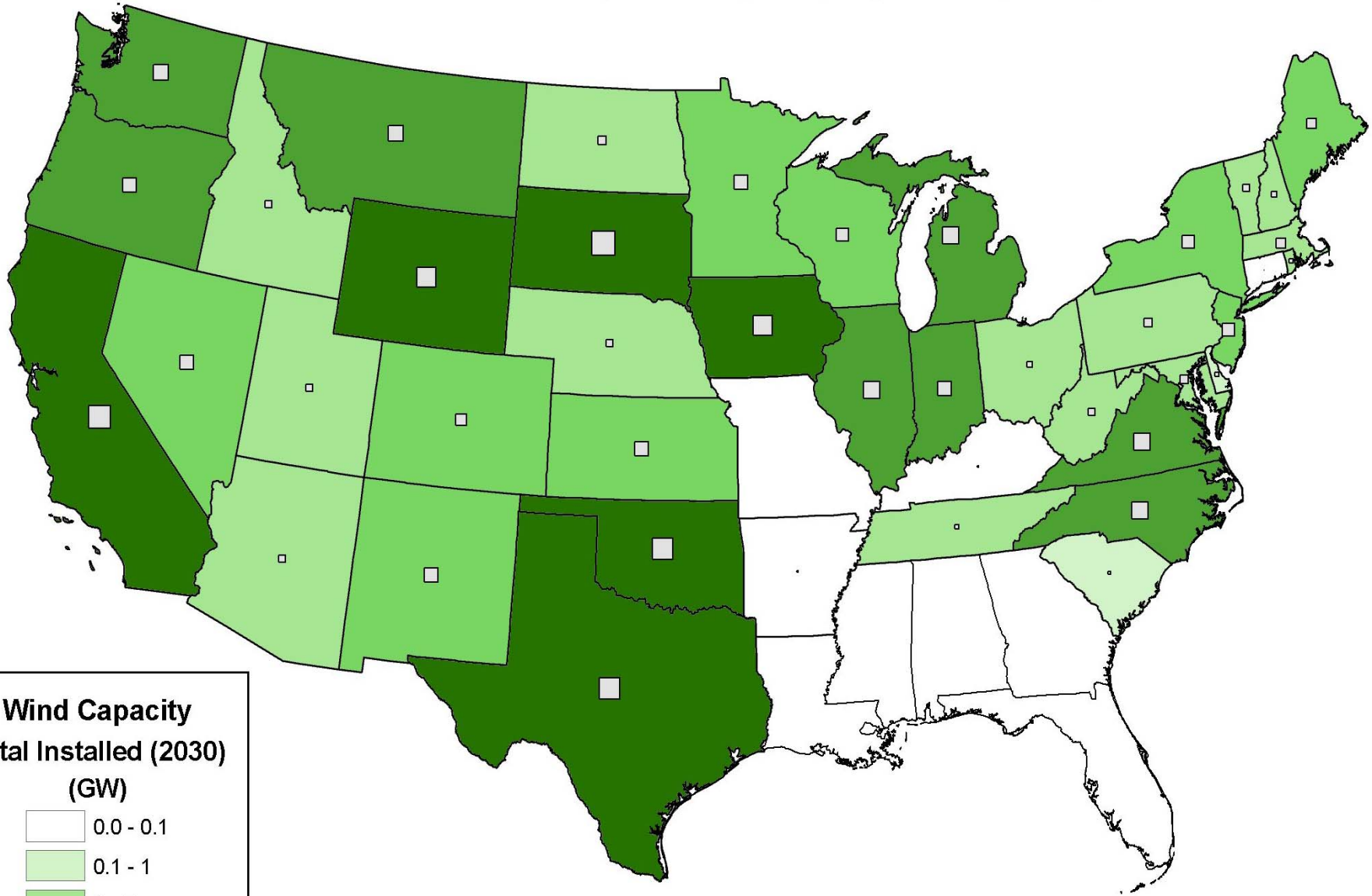
Vision

Wind energy will provide 20% of U.S. electricity needs by 2030, securing America's leadership in reliable, clean energy technology. As an inexhaustible and affordable domestic resource, wind strengthens our energy security, improves the quality of the air we breathe, slows climate change, and revitalizes rural communities.

awea

american wind energy association

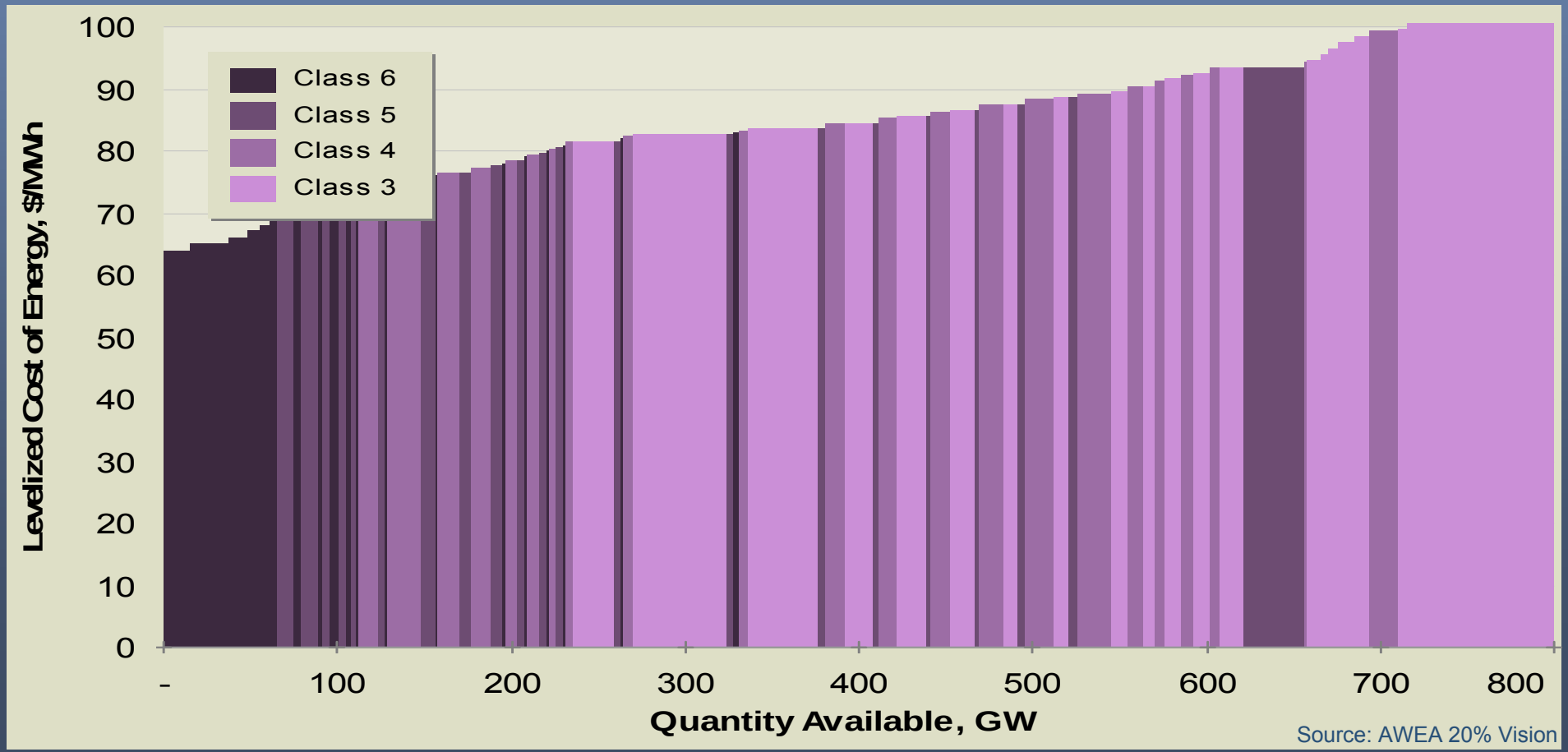
Installed Wind Nameplate Capacity by State (2030)



20% Wind RPS - Policy1_20061027 - DRAFT

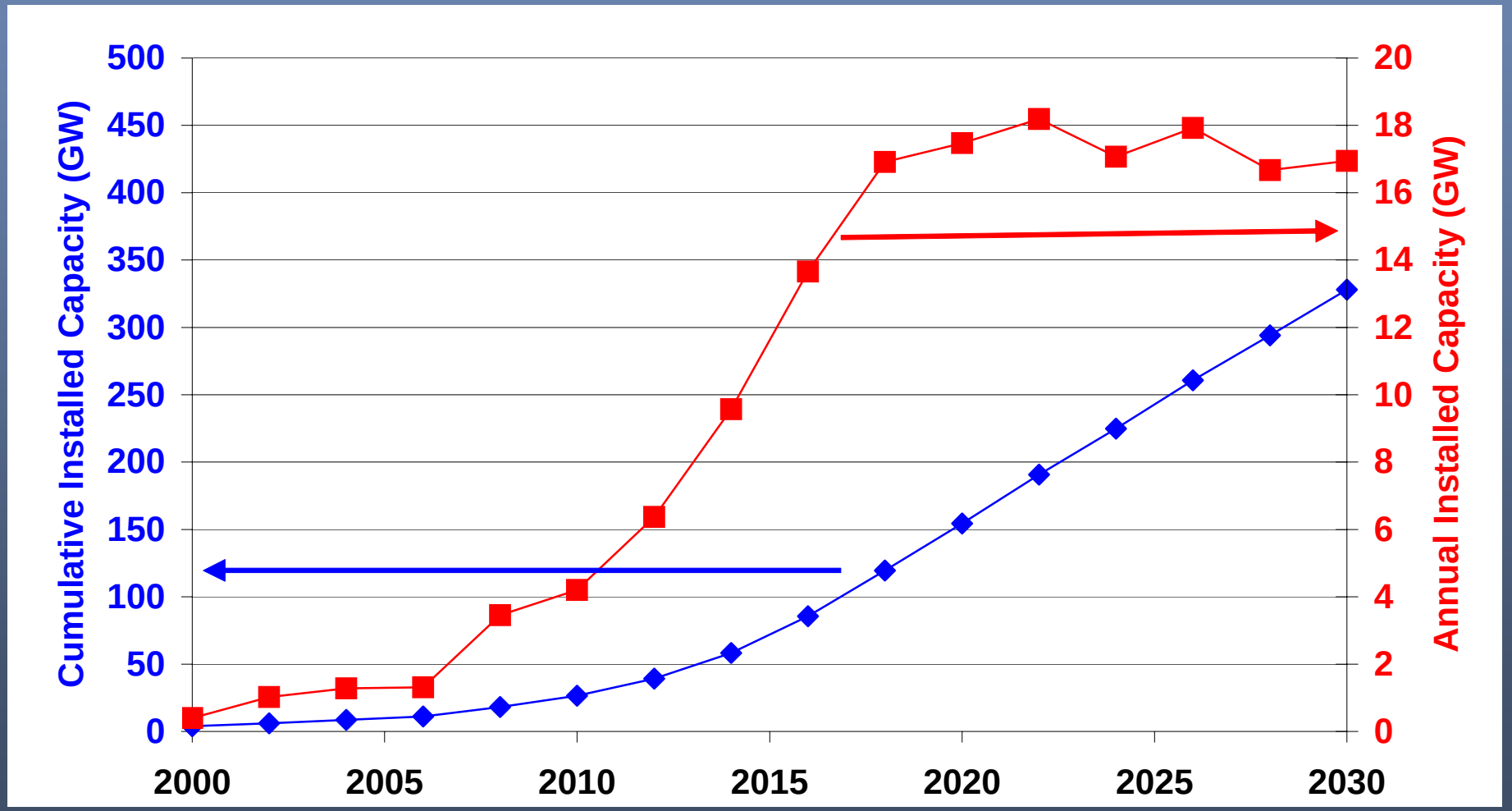
Credible, Independent Analysis

- Black and Veatch, an engineering firm with large nuclear, coal, and gas businesses
- Finds 350 GW of wind available today for a delivered cost of under $85/MWh without any form of policy support



Source: AWEA 20% Vision

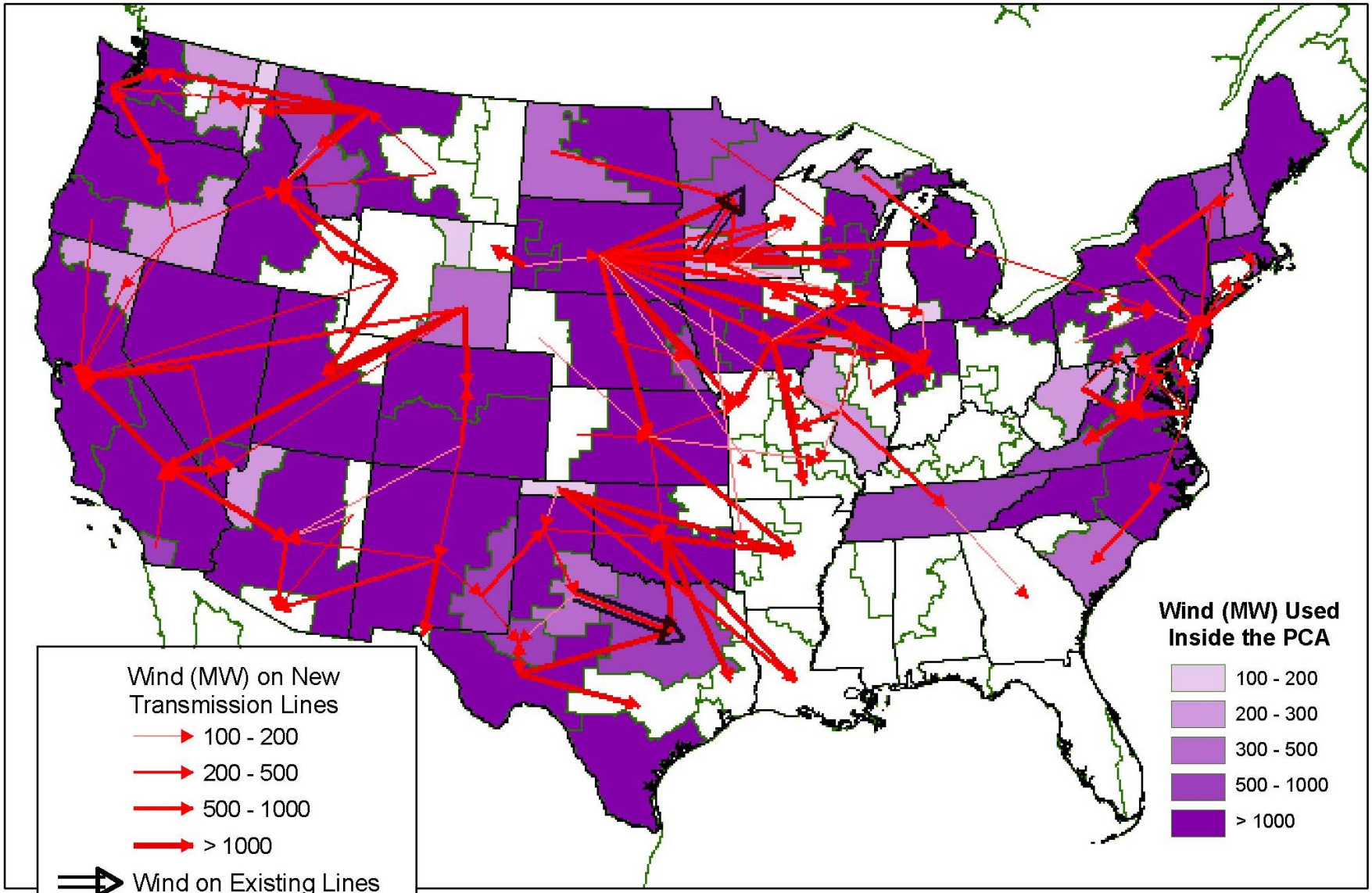
What does 20% Wind look like?



Source: AWEA 20% Vision

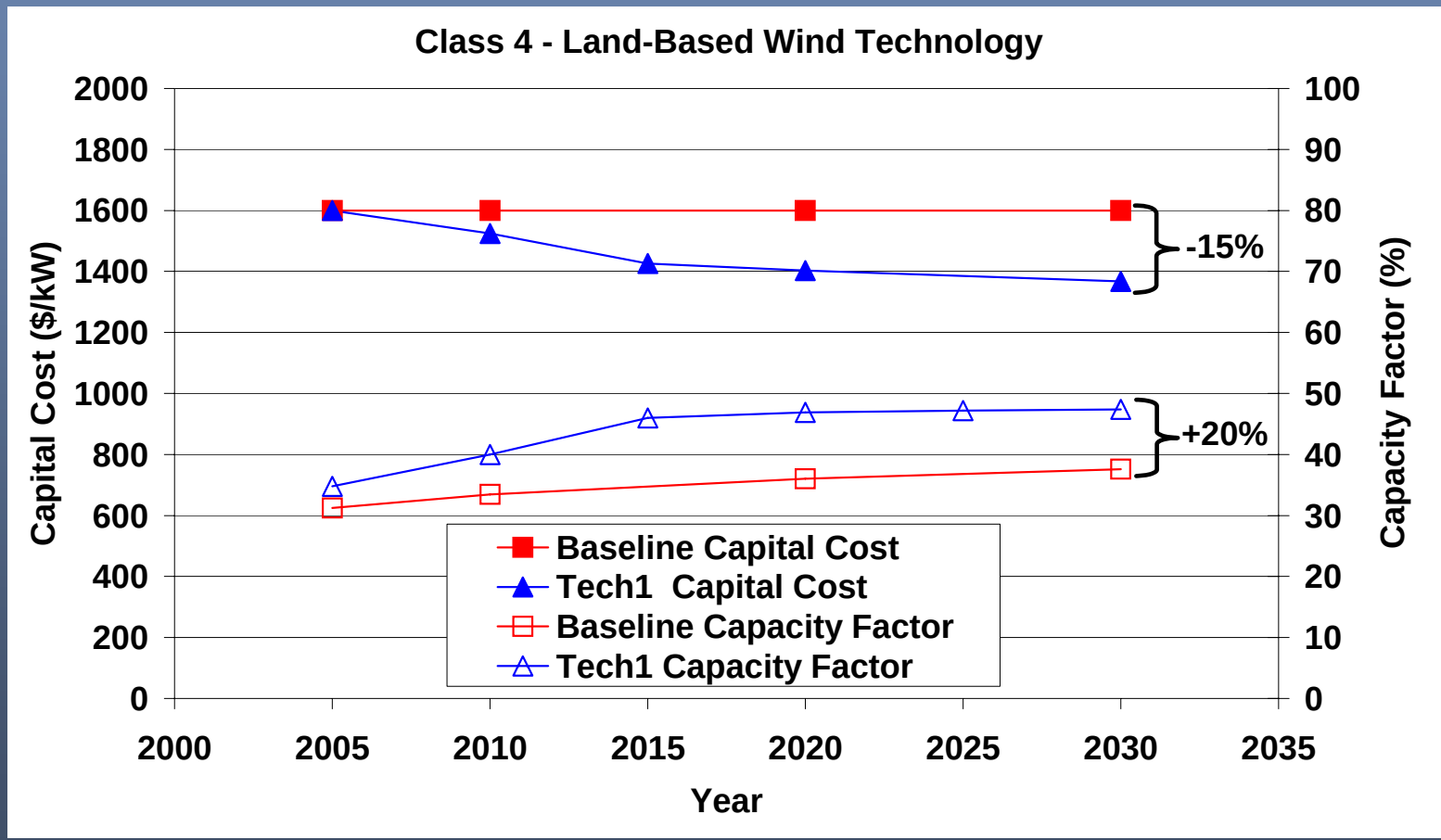
2030 - Between PCA Transfers and In-PCA Use for Wind (All Classes)

Total Between PCA Transfer >= 100 MW (all power classes, onshore and offshore)
Arrows originate and terminate at the centroid of the PCA for visualization purposes; they do not represent physical locations of transmission lines.



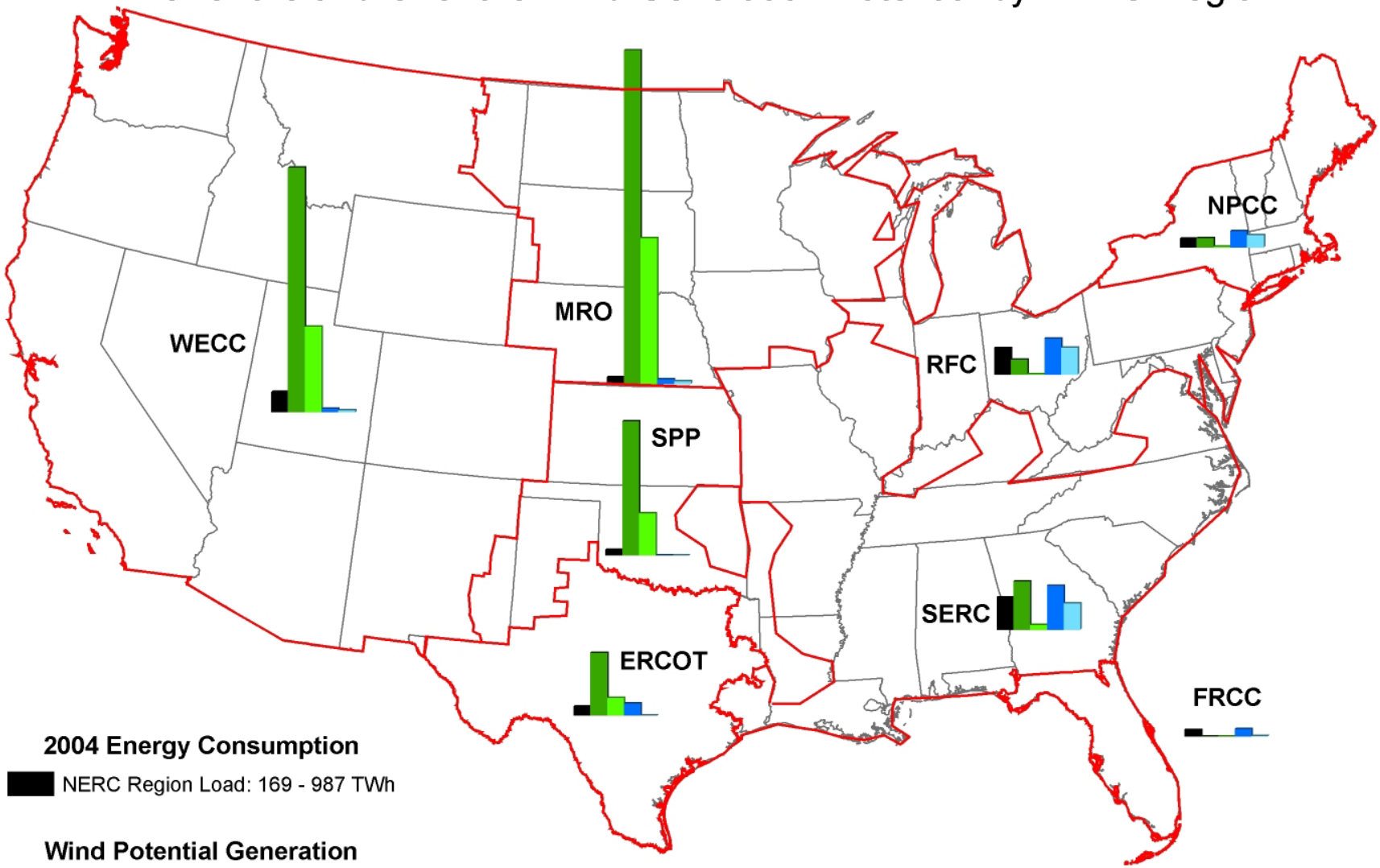
20% Wind RPS - Policy1_20061027 - DRAFT

Cost reduction and performance improvement associated with R&D…



Source: AWEA 20% Vision

Onshore and Offshore Wind Generation Potential by NERC Region



2004 Energy Consumption

NERC Region Load: 169 - 987 TWh

Wind Potential Generation

- Onshore, Class 3 and greater: 0 - 10,013 TWh
- Onshore, Class 4 and greater: 0 - 4,390 TWh
- Offshore, Class 4 and greater: 0 - 1,325 TWh
- Offshore, Class 5 and greater: 0 - 803 TWh

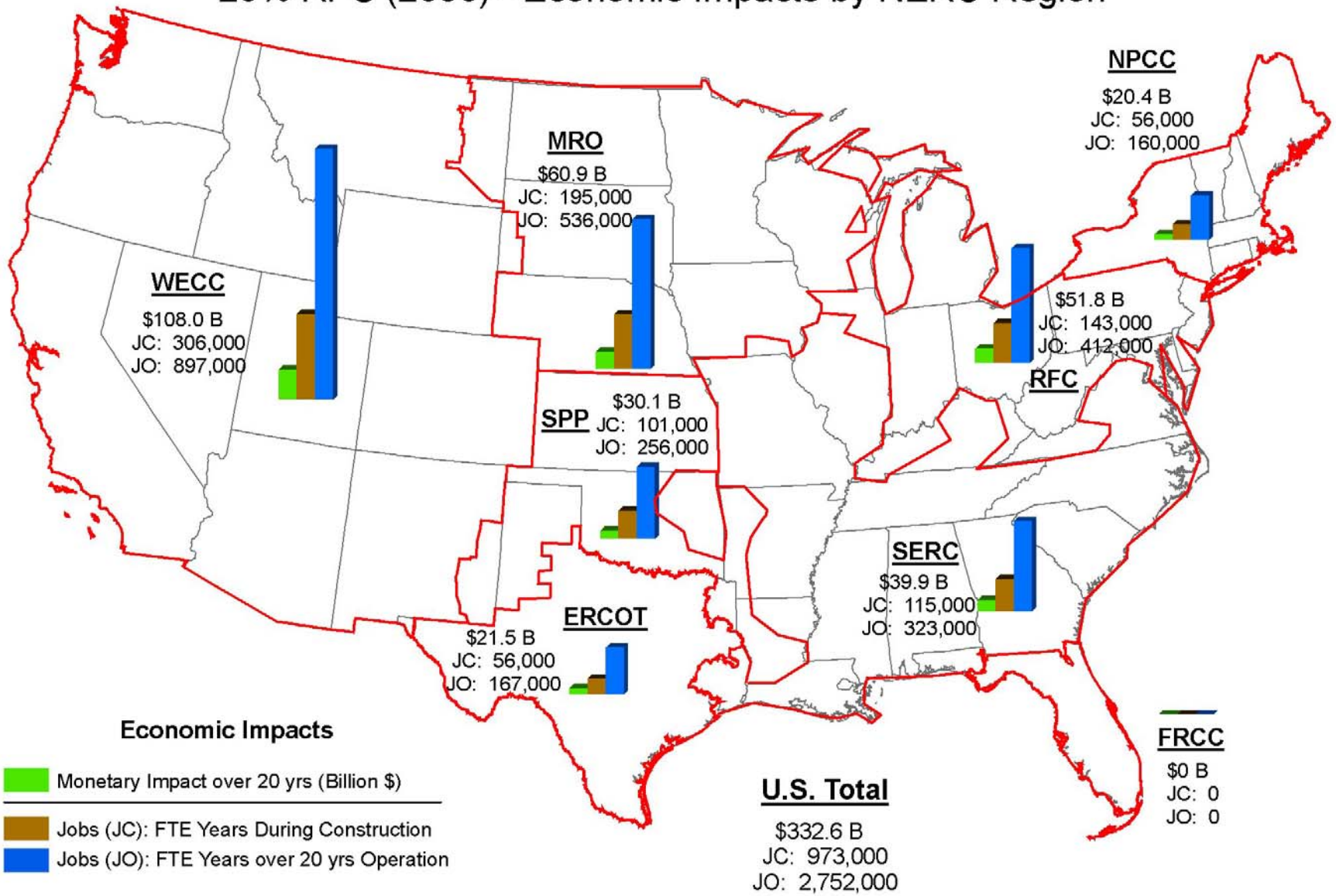
Exclusions were applied to the onshore wind resource areas. Offshore resource was limited to shallow areas (<30 m) within 50 nm of shore.

U.S. Department of Energy
National Renewable Energy Laboratory

NREL

02-JUN-2006

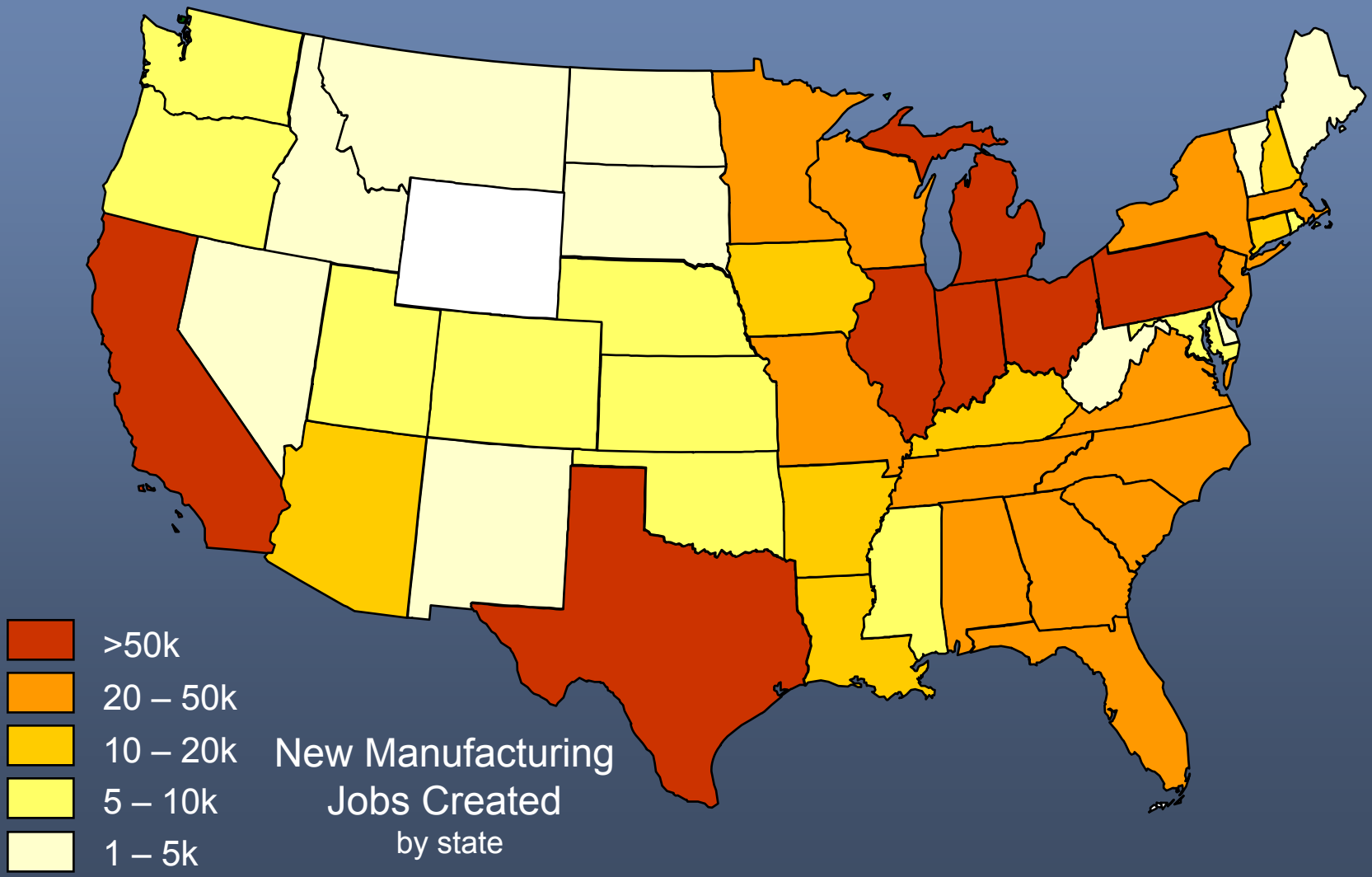
20% RPS (2030) - Economic Impacts by NERC Region



360 GW of installed wind capacity.

20% Wind Scenario

New Manufacturing Jobs



Source: REPP (extrapolated)

No Resource Show Stoppers to 20%

- With stable and predictable market, manufacturing is readily expandable
- Using a very aggressive 20% by 2020 Sustained Manufacturing Model:

  ~ 4% of 2005 U.S. annual steel production, 0.3% of 2005 world annual production

  ~ 32% of 2005 U.S. fiberglass production – no base material limits

  ~ 0.75% of USGS estimates of U.S. reserves for rare earth magnets – no base material limits

  ~ 150,000 FTE for a geographically dispersed industry – can focus in rural areas where development is needed

  ~ 4% of 2005 U.S. annual copper consumption and < 2.5% of U.S. copper reserves – no base material limits

  Steel and copper are needed for any generation technology and are recyclable for future generations of turbines.

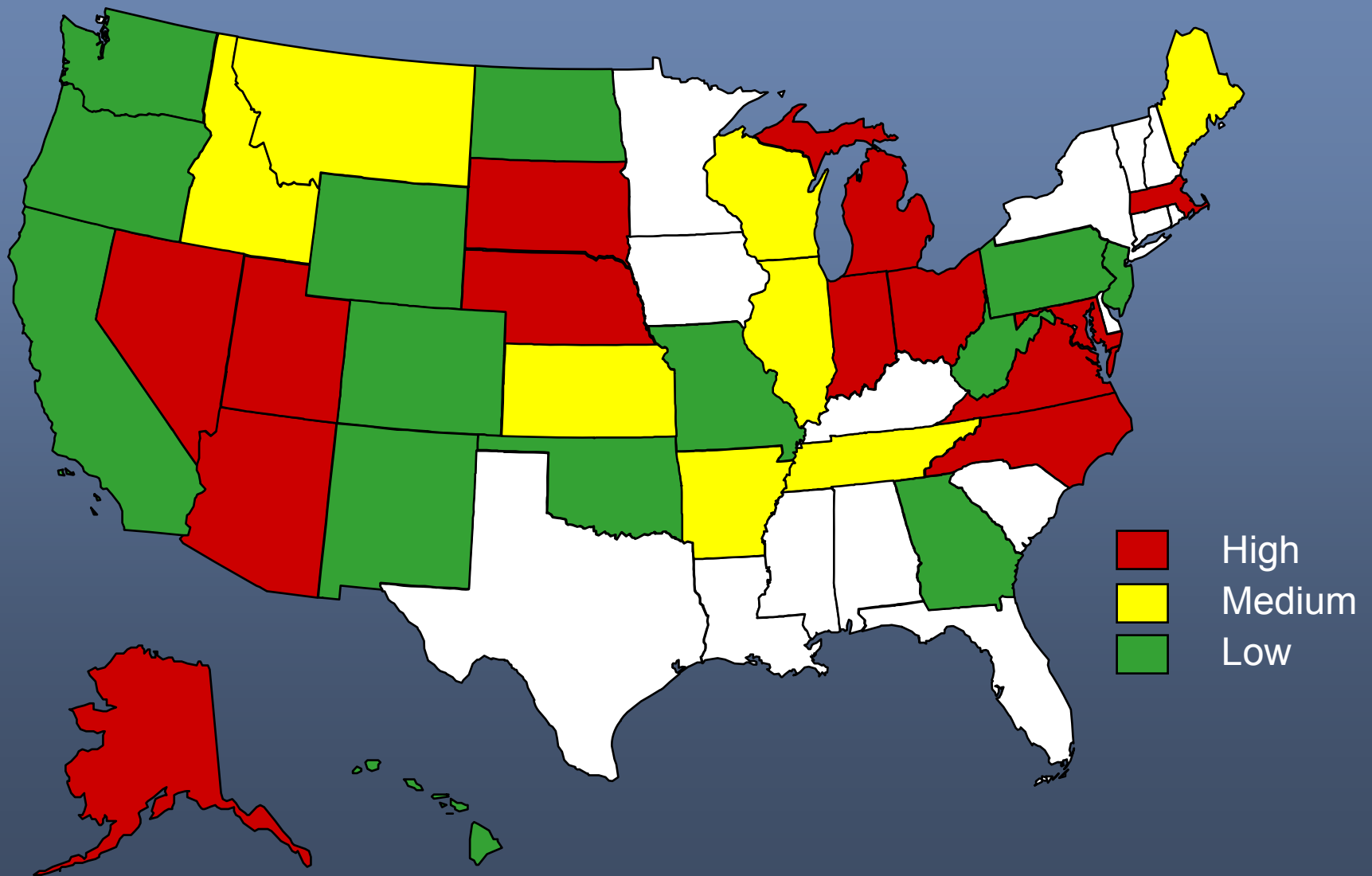
  Further analysis and more detailed investigation required

Conclusions

- 20% wind energy penetration is possible
- 20% penetration is not going to happen under business as usual scenarios
- Policy choices will have a large impact on assessing the timing and rate of achieving a 20% goal
- Key issues: market transformation, transmission, project diversity, technology development, policy, public acceptance
- 20% Vision action plan: WindPower 2007

Source: AWEA 20% Vision

Wind Powering America Priority States



State Maturity Index – 2006
Midwest

	Installed Capacity*	WWG Effectiveness	Policy Environment
Illinois	107		
Indiana	0		
Iowa	836		
Kentucky	0		
Michigan	3		
Minnesota	744		
Missouri	0		
Nebraska	73		
North Dakota	98		
Ohio	7		
South Dakota	44		
Tennessee	29		
Wisconsin	53		

Installed Capacity*
< 20 MW
20-100 MW
100-500 MW
> 500 MW

WWG Effectiveness
None
Formative
Maturing
Sustainable

Policy Environment
Minimal
Selective
< 10% RPS
> 10% RPS

*based on data through 1/19/06

State Maturity Index – 1999
Midwest

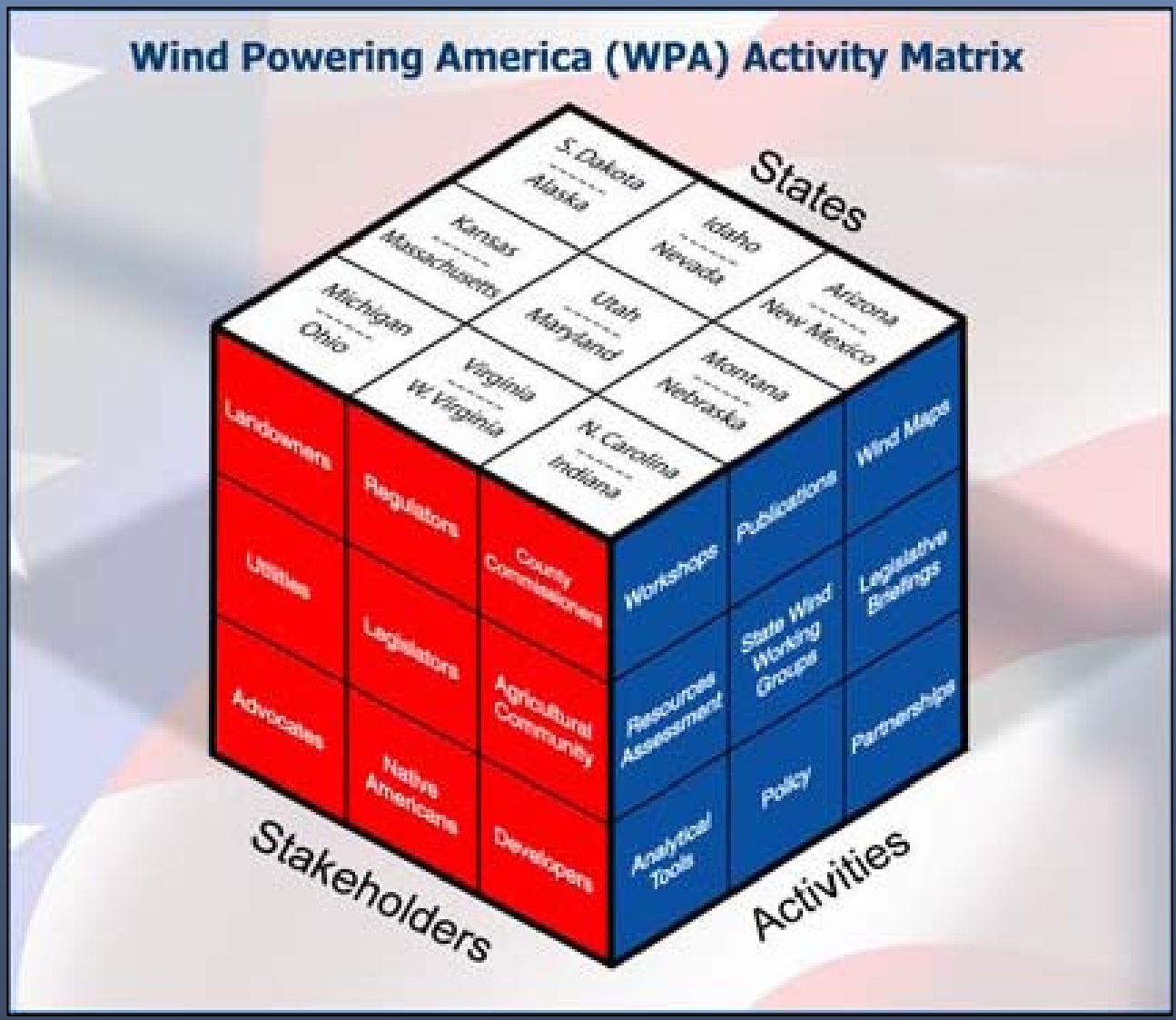
	Installed Capacity*	WWG Effectiveness	Policy Environment
Illinois			
Indiana			
Iowa	243		
Kentucky			
Michigan			
Minnesota	273		
Missouri			
Nebraska	3		
North Dakota			
Ohio			
South Dakota			
Tennessee			
Wisconsin	23		

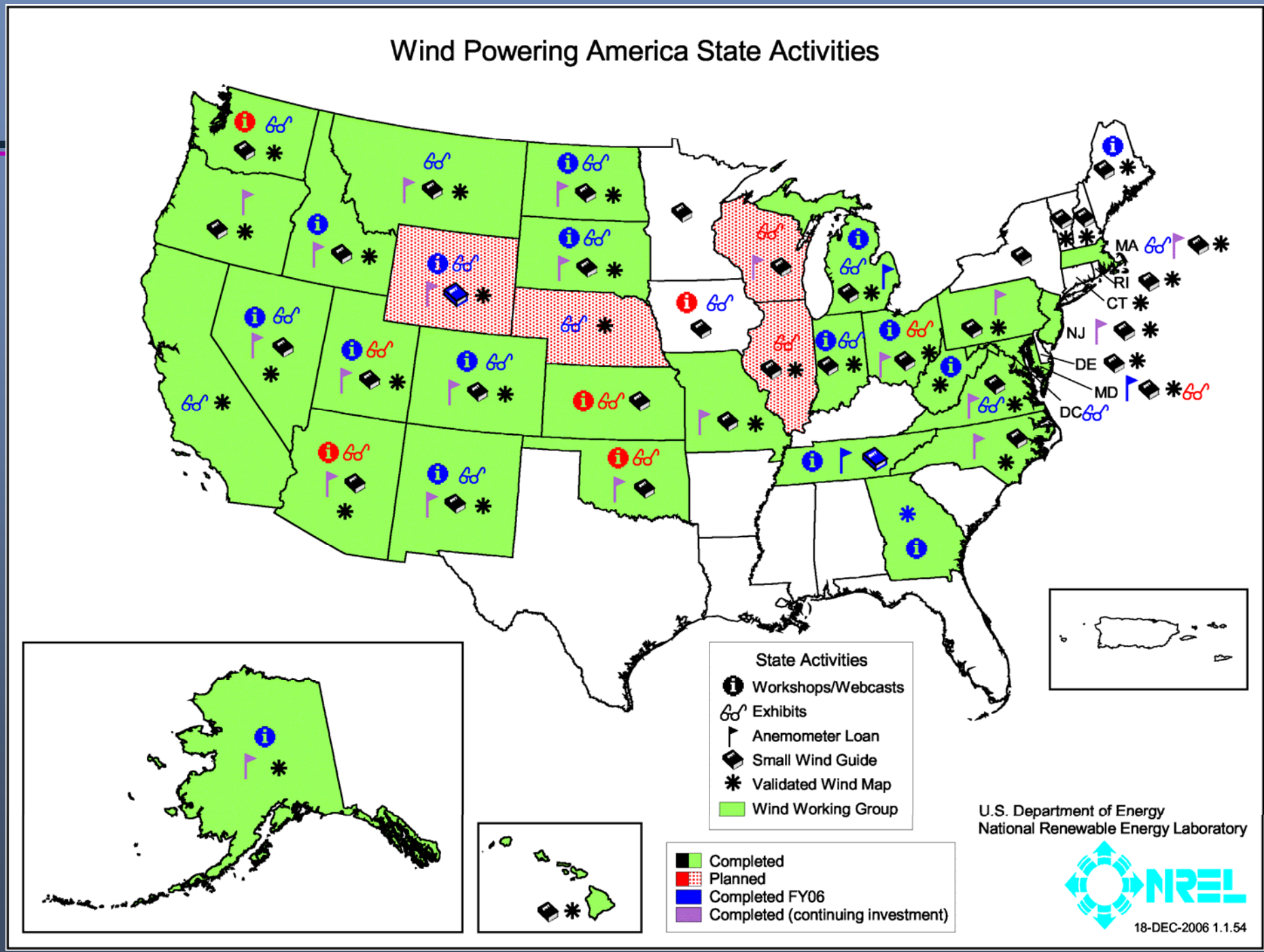
Installed Capacity*
< 20 MW
20-100 MW
100-500 MW
> 500 MW

WWG Effectiveness
None
Formative
Maturing
Sustainable

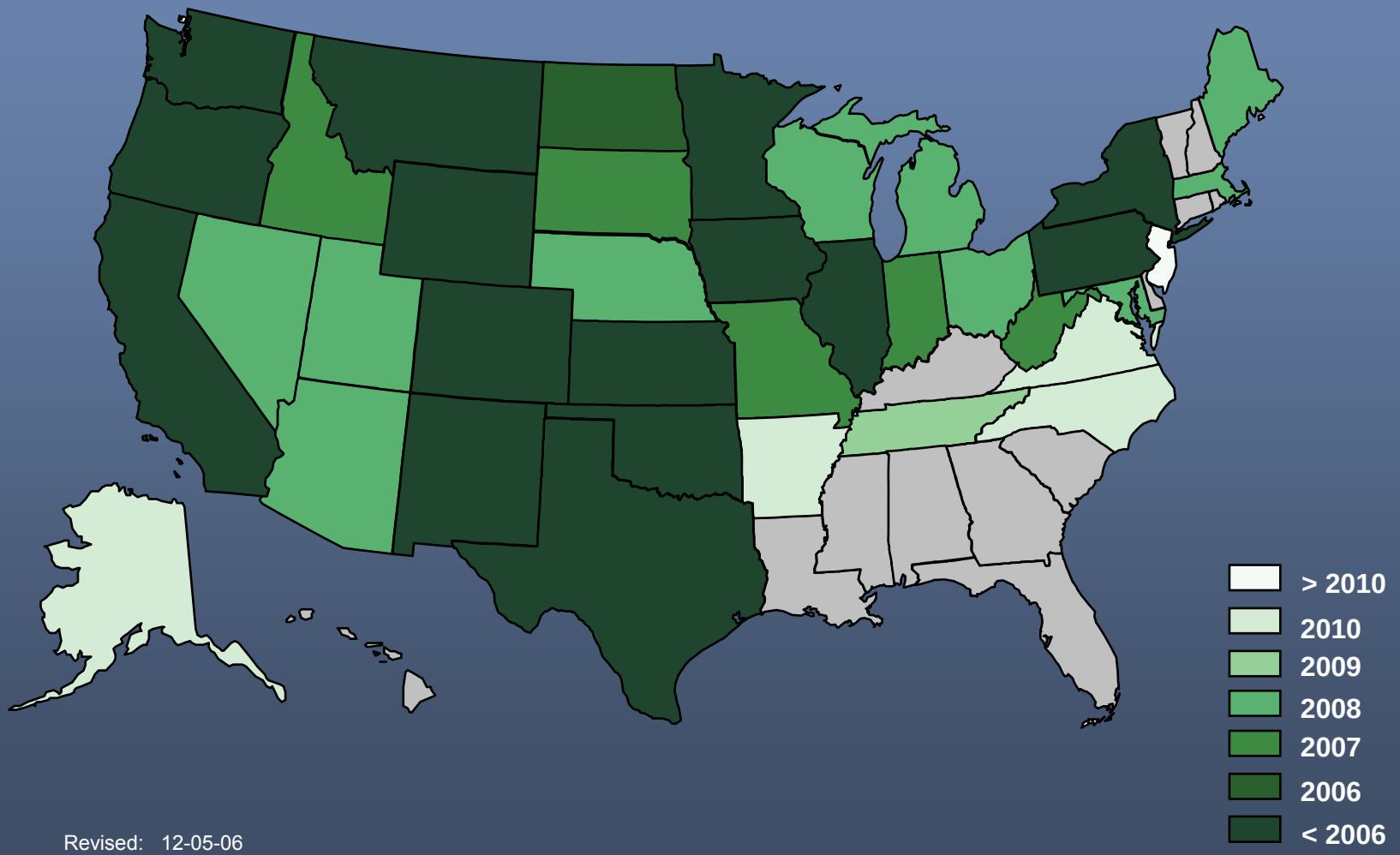
Policy Environment
Minimal
Selective
< 10% RPS
> 10% RPS

*based on data through 12/31/99


Wind Powering America (WPA) Activity Matrix
States
S. Dakota
Alaska
Idaho
Nevada
Arizona
New Mexico
Kansas
Massachusetts
Utah
Maryland
Michigan
Ohio
Virginia
W. Virginia
Montana
Nebraska
N. Carolina
Indiana
Landowners
Regulators
County Commissioners
Utilities
Legislators
Agricultural Community
Advocates
Native Americans
Developers
Stakeholders
Workshops
Publications
Wind Maps
State Wind Working Groups
Legislative Briefings
Resources Assessment
Policy
Partnerships
Analytical Tools
Activities


Wind Powering America State Activities
MA
RI
CT
NJ
DE
MD
DC
State Activities
Workshops/Webcasts
Exhibits
Anemometer Loan
Small Wind Guide
Validated Wind Map
Wind Working Group
Completed
Planned
Completed FY06
Completed (continuing investment)
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
18-DEC-2006 1.1.54

> 100 MW Installed Capacity by Year (projected)



Revised: 12-05-06

Indiana Wind Working Group Activities

- Kick-off meeting, Purdue University November 2005
  - Tall towers study findings, 2004-2005
  - Richmond Power & Light tall tower study
- National and Regional meetings/workshops
  - American Wind Energy Association workshops/meetings
    - See handout for upcoming events
  - Great Lakes Offshore Wind Collaborative
    - AWS Truewind and DOE resource study
  - Educational presentations
    - East Central Indiana landowners field trip, 1/13/2006
    - Spring trip to IL wind farm
- Office of Energy & Defense Development website
  - www.energy.in.gov

Indiana Wind Working Group Activities

1. Introductions
   - Name, organization, interest in wind power development in Indiana
2. Networking/Bathroom break
3. IWWG Planning Session for 2007
   - Small group brainstorming
   - Sharing with the large group
   - Discussion
   - Next meeting
     - Friday, February 16, 2007

IWWG Planning Session for 2007

- What topics/issues should the IWWG address in 2007?
- Continue to meet as a large group or do we create sub-committees? How often?
- What kinds of activities should the IWWG engage in? e.g. meetings, workshops, conferences, studies, field trips, etc.
- How to best spend $50k/year IWWG budget?
- Other ideas/issues?

Carpe Ventem











www.windpoweringamerica.gov