



WIND ENERGY

IN A

***SUSTAINABLE
ENERGY***

FUTURE

RADNOR CONSERVANCY

May 18, 2009

Radnor, Pennsylvania

Brent Alderfer

Executive Vice President

Iberdrola Renewables

U.S. Generation From COAL 50%



U.S. Generation From GAS 20%



Inductrade "Power Plants Around the World"

U.S. Generation From NUCLEAR 19%

Power Plants Around the World

U.S. Generation From HYDRO 7%

GRAND COULEE DAM

U.S Generation From WIND 2%





U.S. Generation From SOLAR 0.1 %

Googleplex

Location: CA

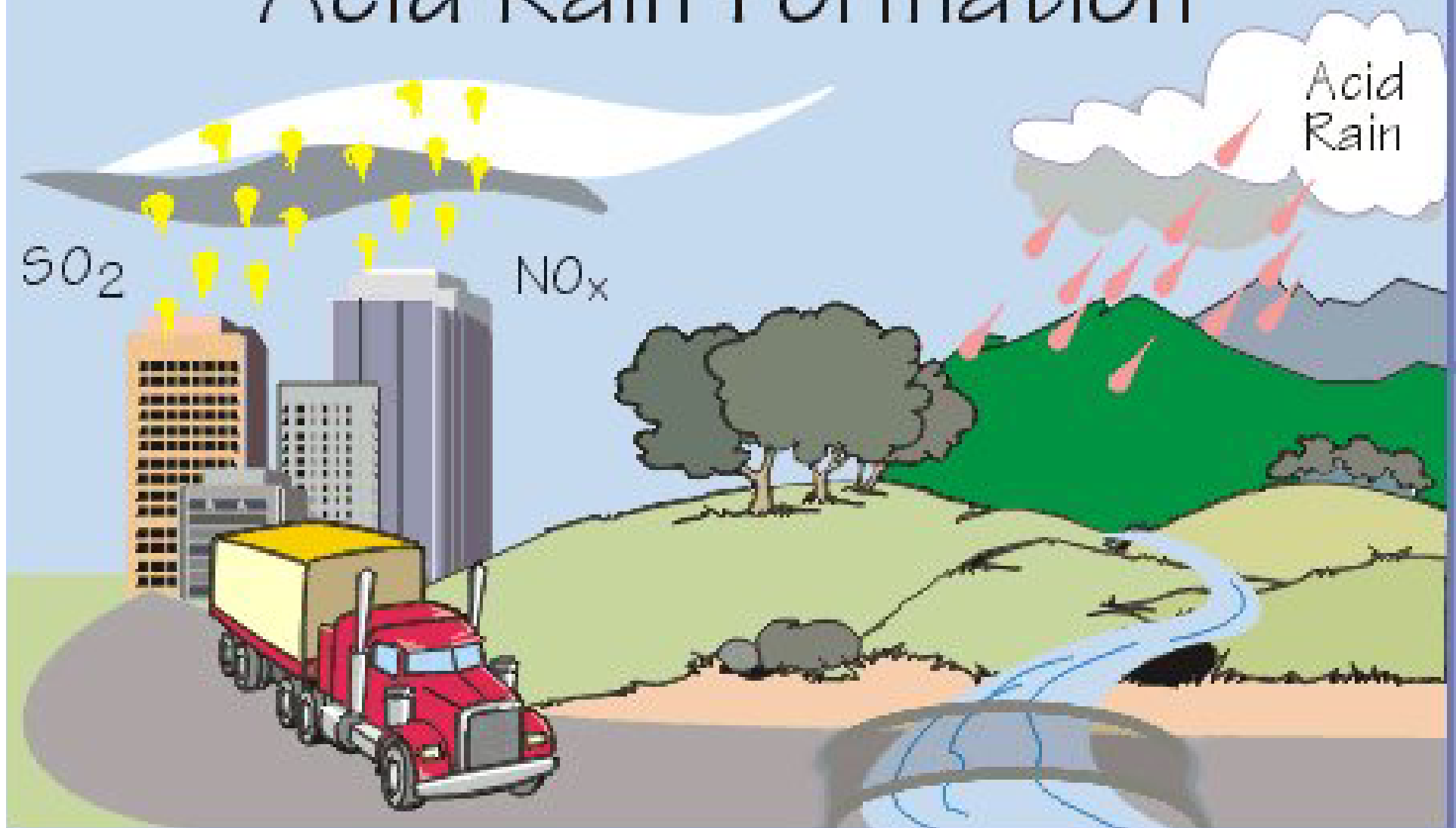
Operator: Google

Configuration: 1.6 MWp PV

Operation: 2007

System supplier: Sharp

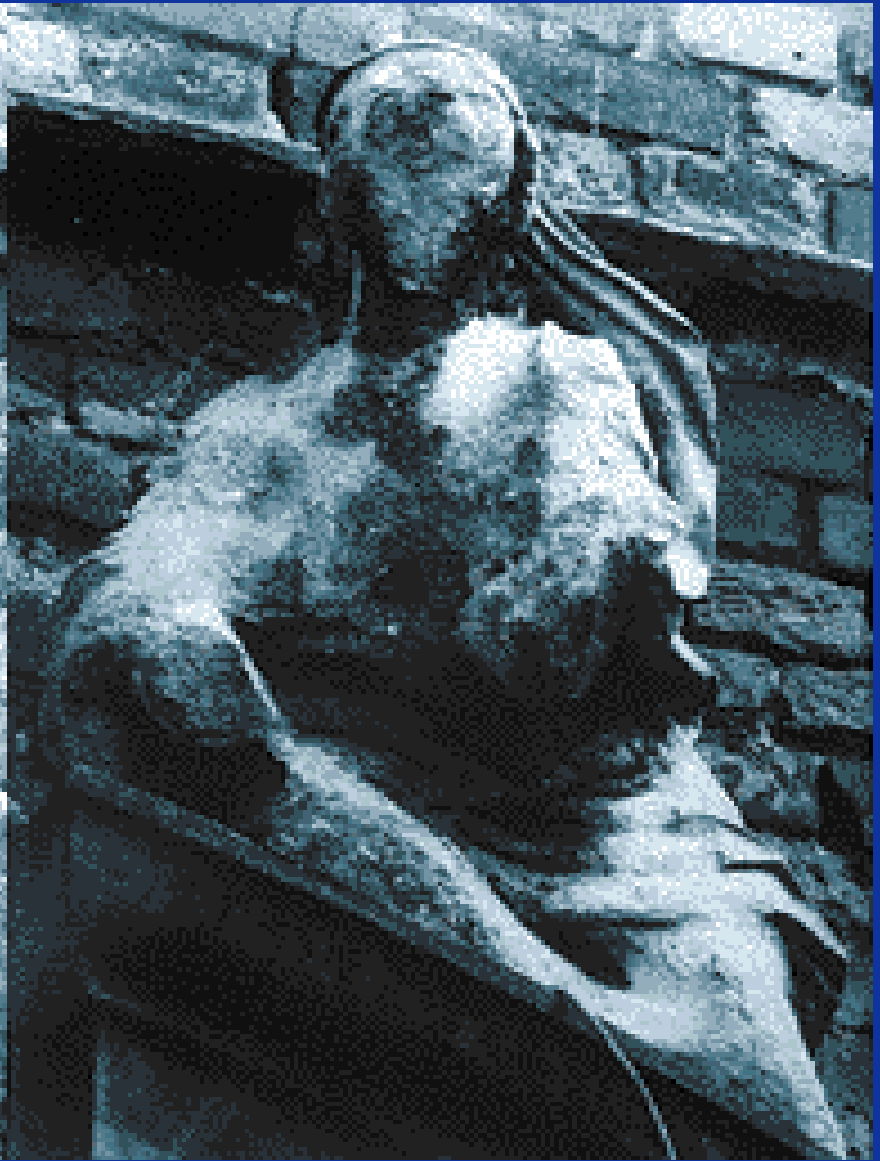
Acid Rain Formation



Acid Rain Tree Damage

Aluminum Affecting
Roots

Mount Mitchel NC

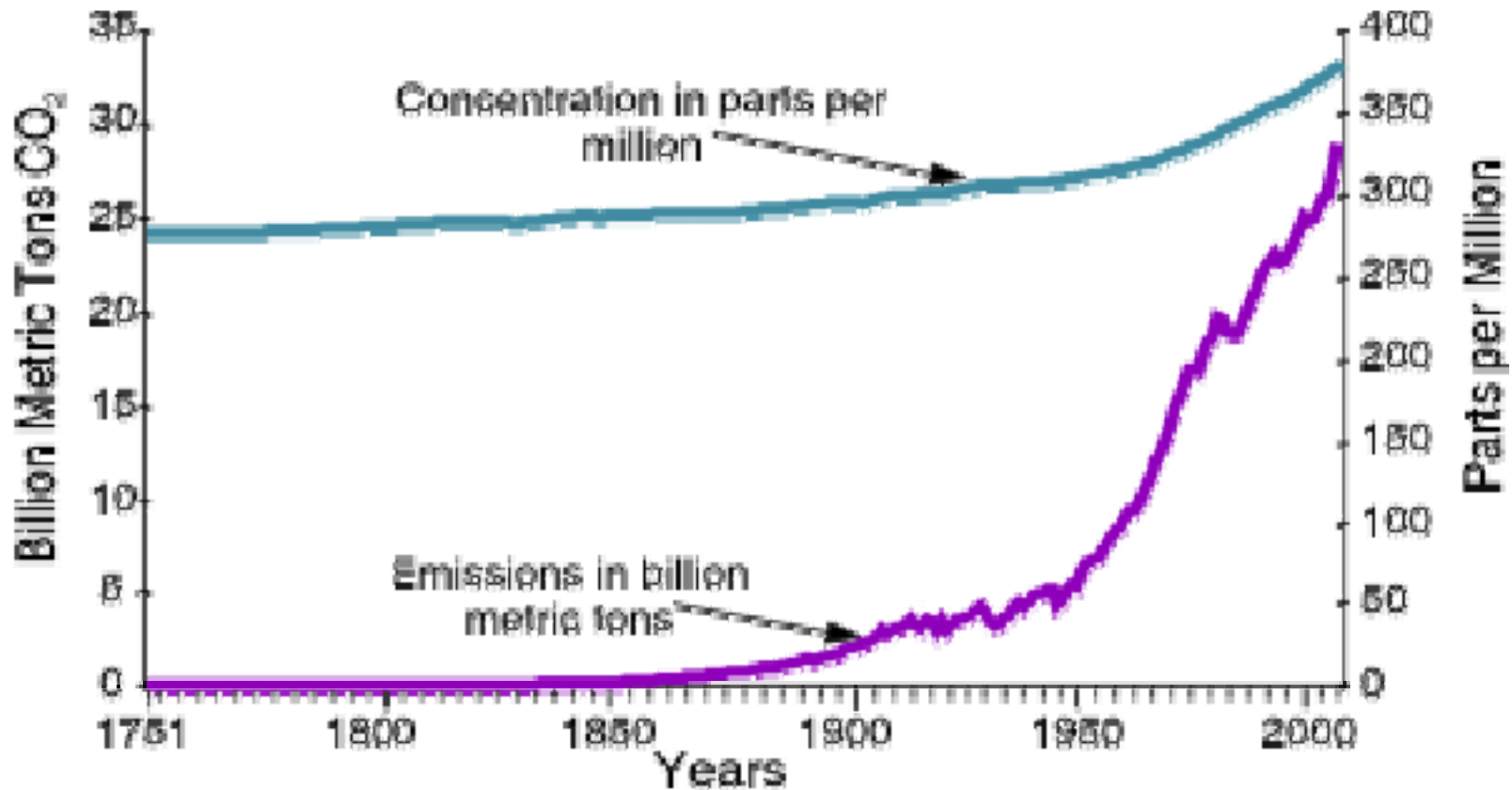


Global Warming & Climate Change



Global Carbon Cycle (Billion Metric Tons
Carbon)

Carbon Dioxide Emissions and Carbon Dioxide Concentrations (1751-2004)



Source: Oak Ridge National Laboratory, Carbon Dioxide Information Analysis Center.

U.S. ENERGY CONSUMPTION (ALL SECTORS)

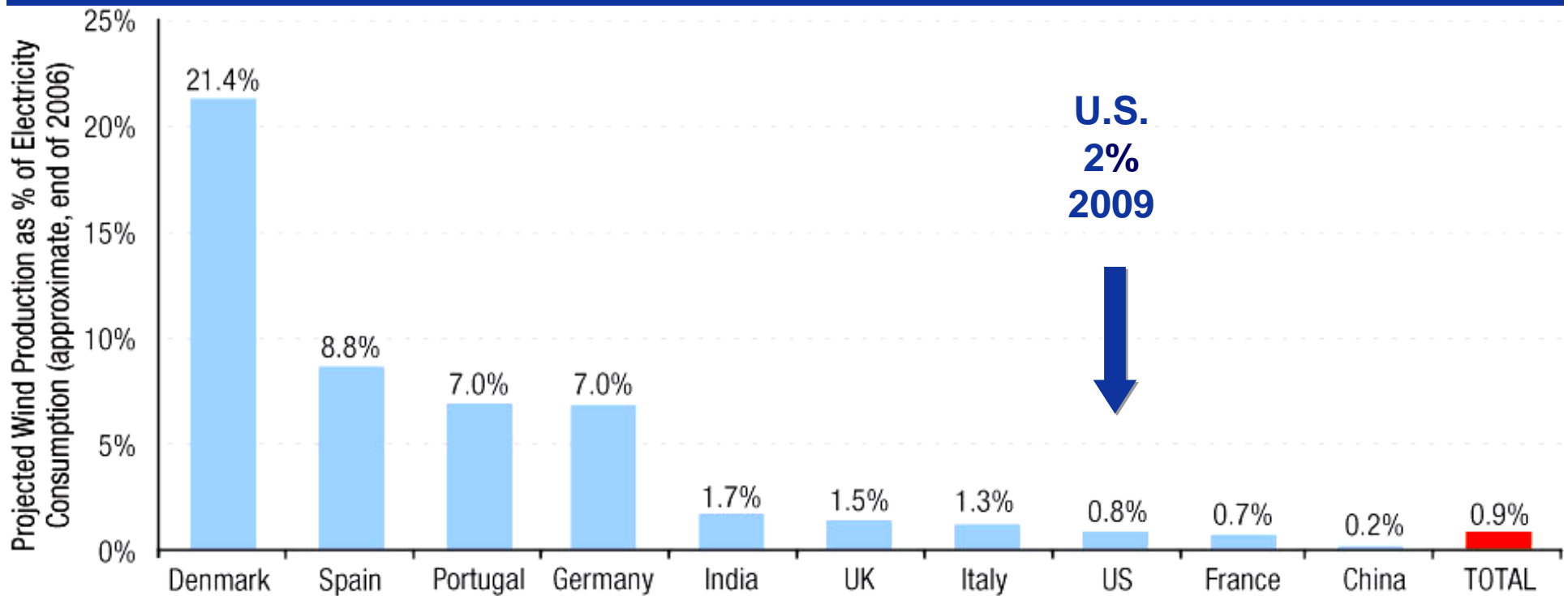
ELECTRICITY GENERATION



40% of Greenhouse Gases (CO₂)
70% of Acid Rain (SO₂ & NO_x)
25% of Smog (Nox & Particulate)

Power Plants Around the World

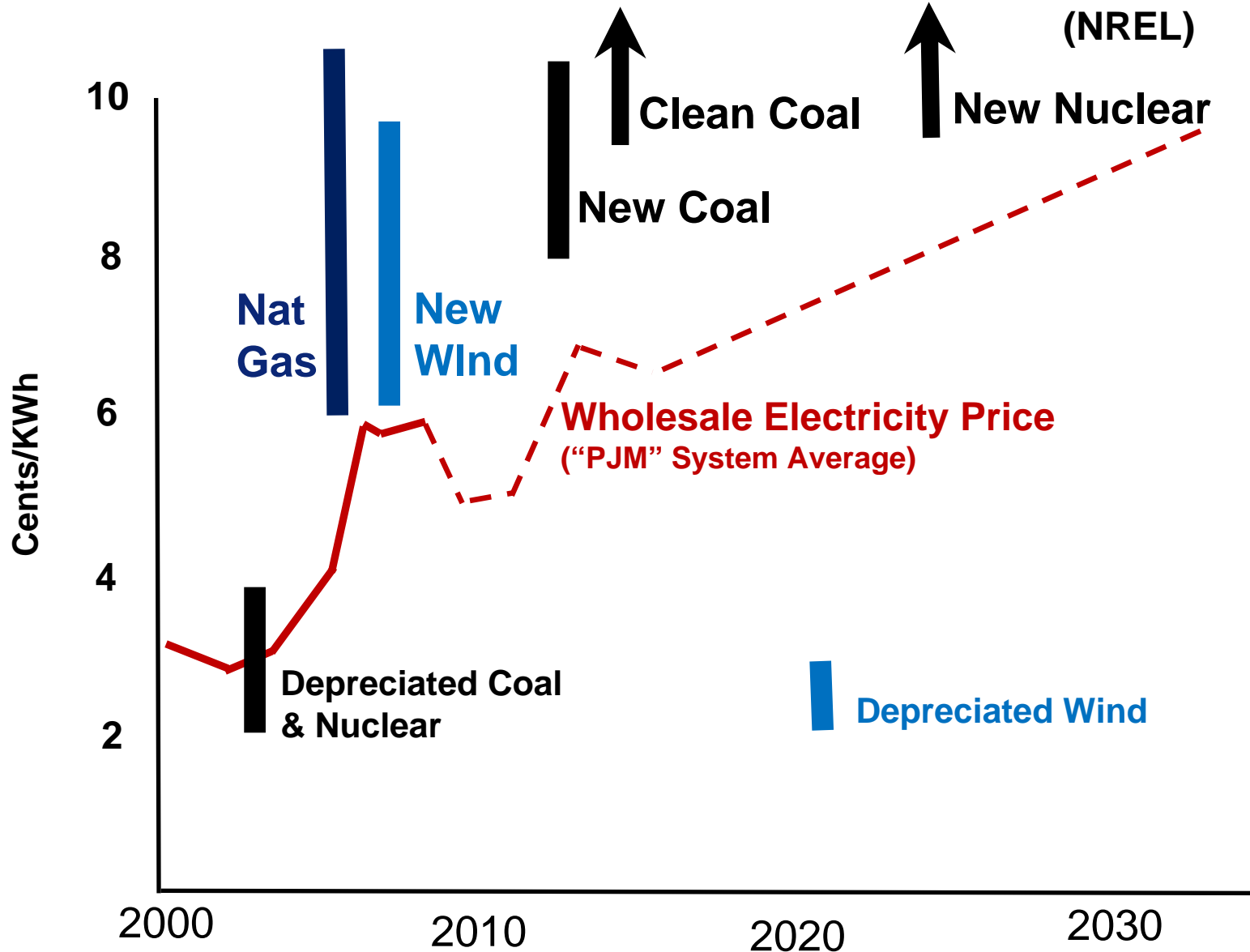
Wind Energy Production As a Percentage of Electricity Consumption



Source: Berkeley Lab estimates based on data from BTM and elsewhere.

Wholesale Generation Cost

(NREL)



THE GOAL FOR WIND ENERGY (U.S.)

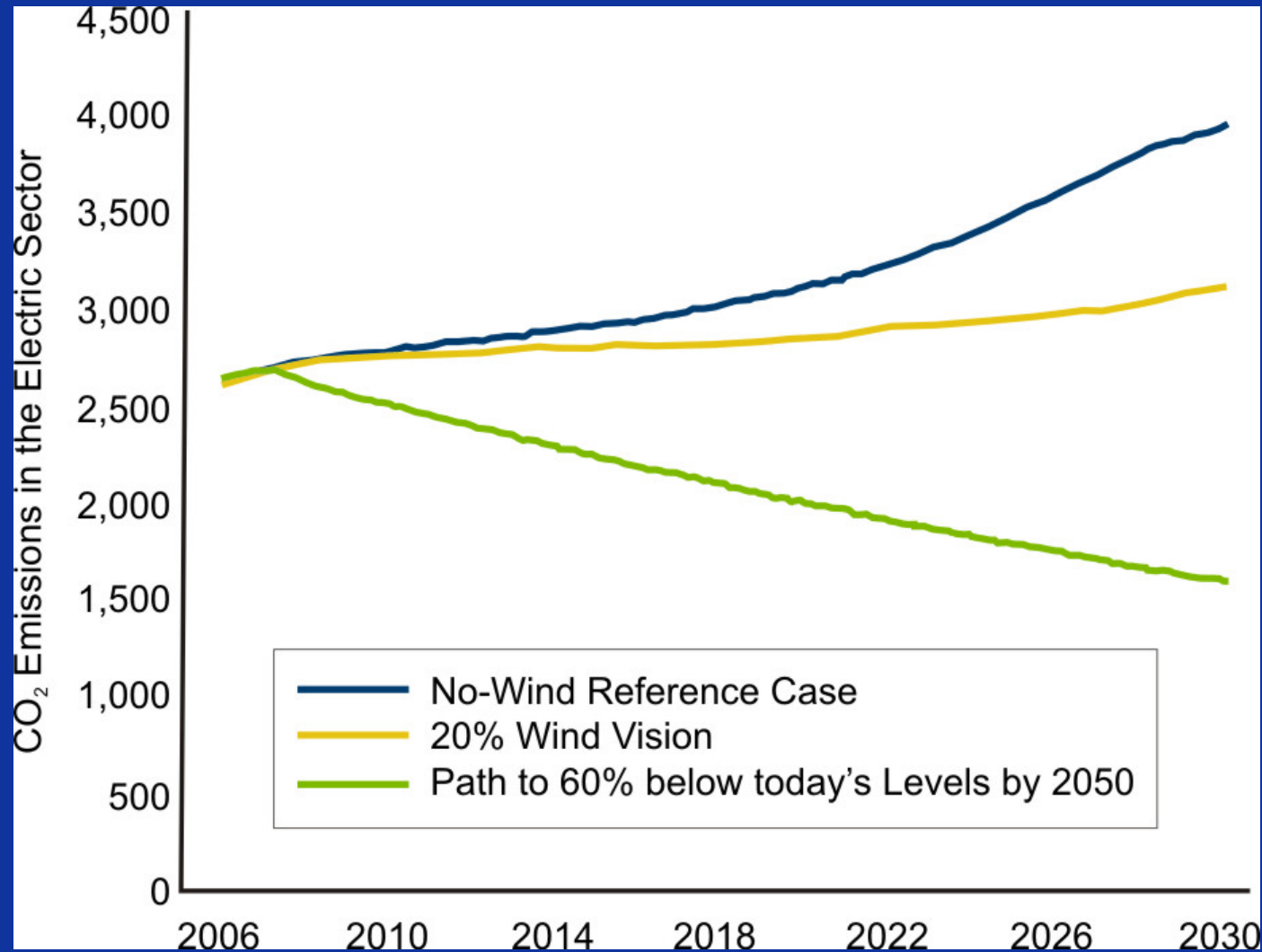
*“Areas with good wind resources have the potential to **supply up to 20% of the electricity** consumption of the United States.”*

*Advanced Energy Initiative
Department of Energy*

*“Wind energy will provide **20% of U.S. electricity needs by 2030**, securing America’s leadership in reliable, clean energy technology.”*

American Wind Energy Association

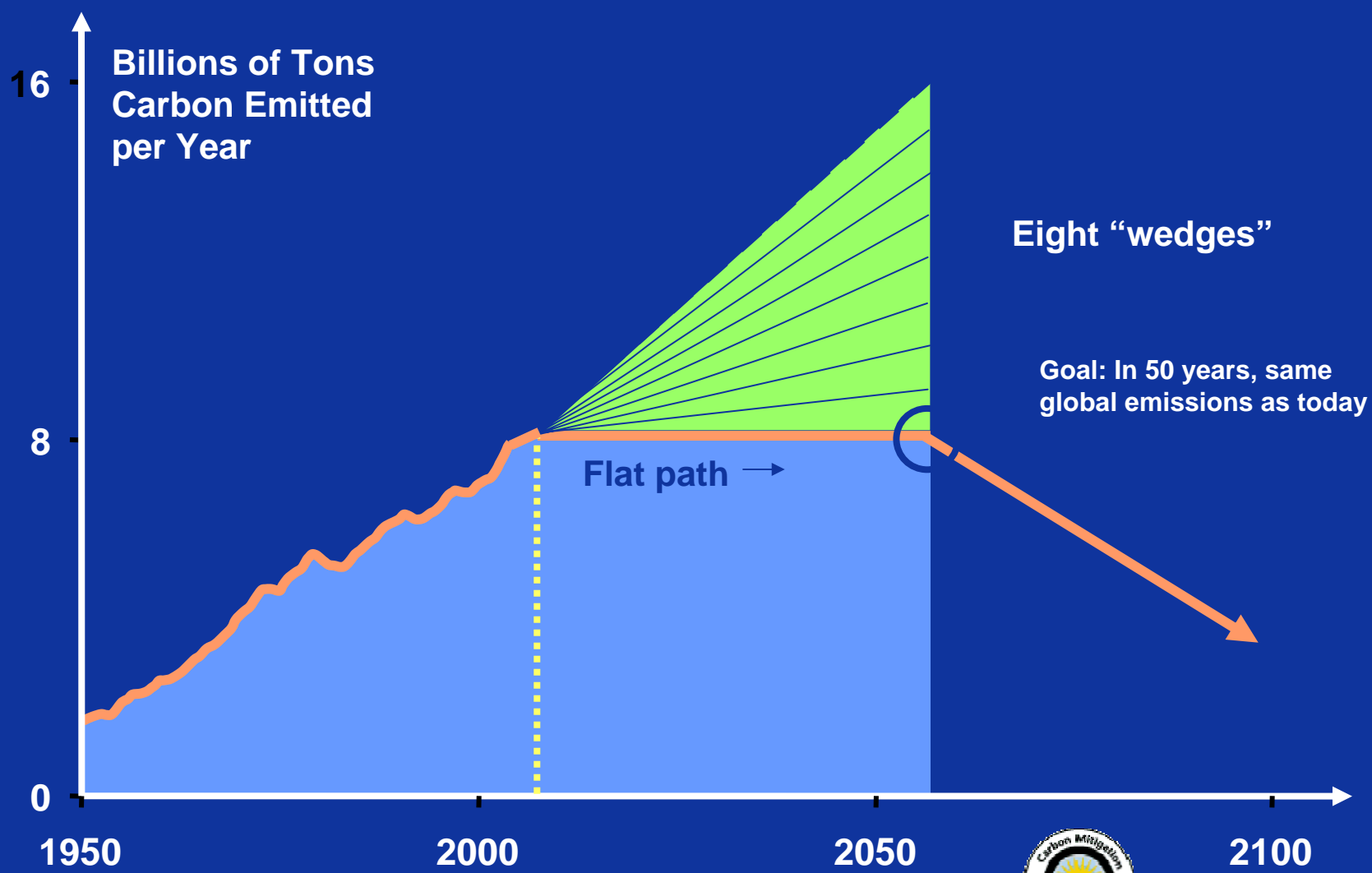
Electric Sector CO₂ Emissions



Source: Edgar DeMeo, Renewable Energy Consulting Services, Inc.
Palo Alto, California

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CO2 Stabilization Wedges



Source: The Carbon Mitigation Initiative, Princeton University
S. Pacala and R. Socolow



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CARBON MITIGATION WITH WIND GENERATION



“A wedge worth of wind electricity will require increasing current capacity by a factor of 30”

Carbon Mitigation Initiative

Install 2 million megawatts of windmills to replace coal-based electricity

Source: The Carbon Mitigation Initiative, Princeton, University
S. Pacala and R. Socolow



Bear Creek Wind Farm Pennsylvania

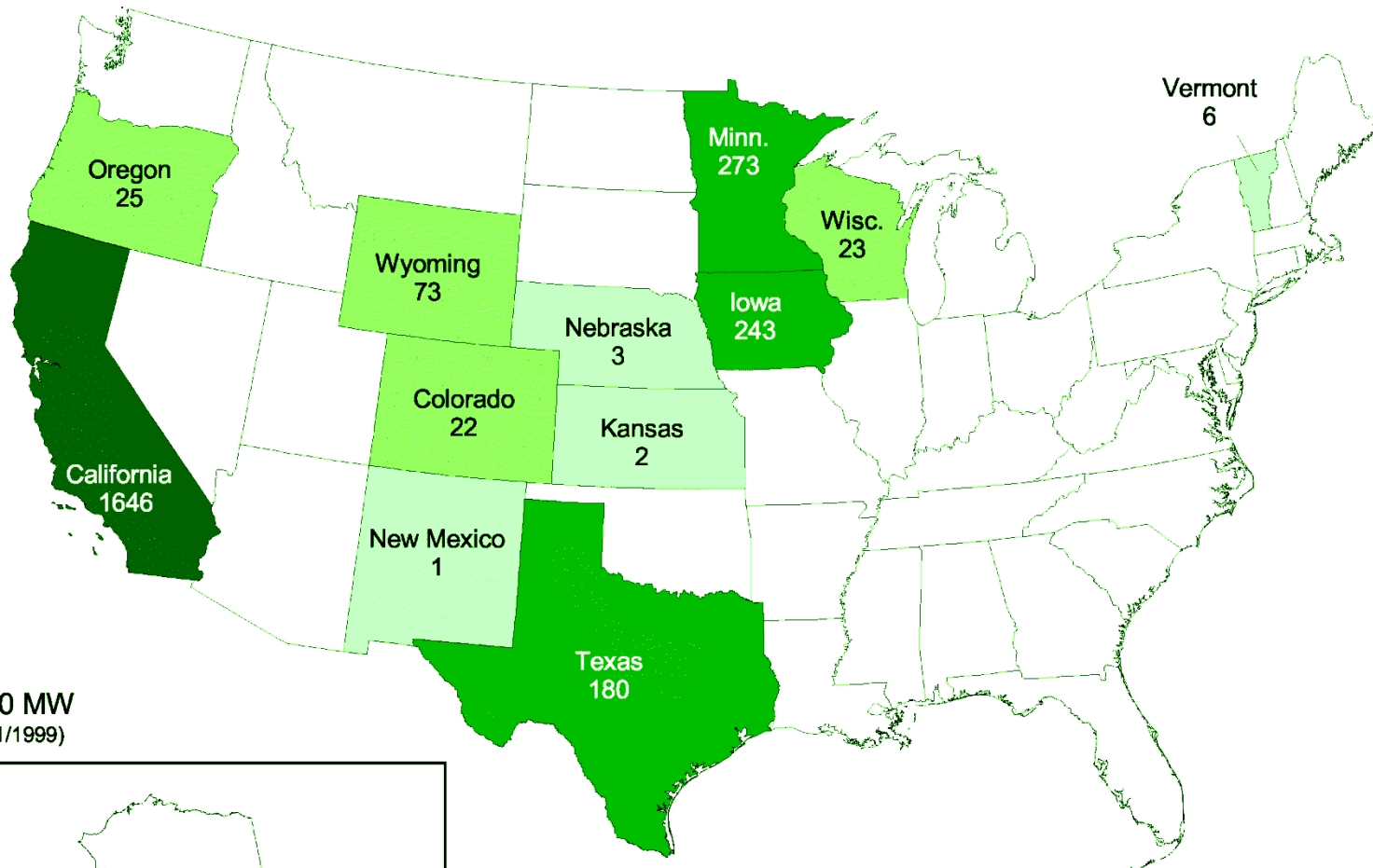


Atlantic City Wind Farm

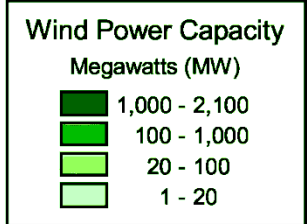
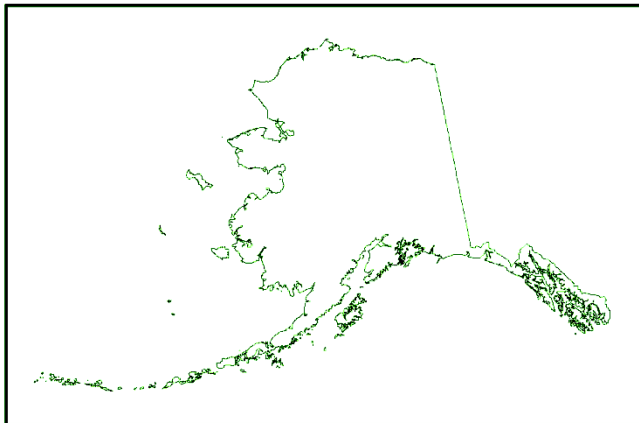
New Jersey



United States - 1999 Year End Wind Power Capacity (MW)



Total: 2,500 MW
(Updated 12/31/1999)

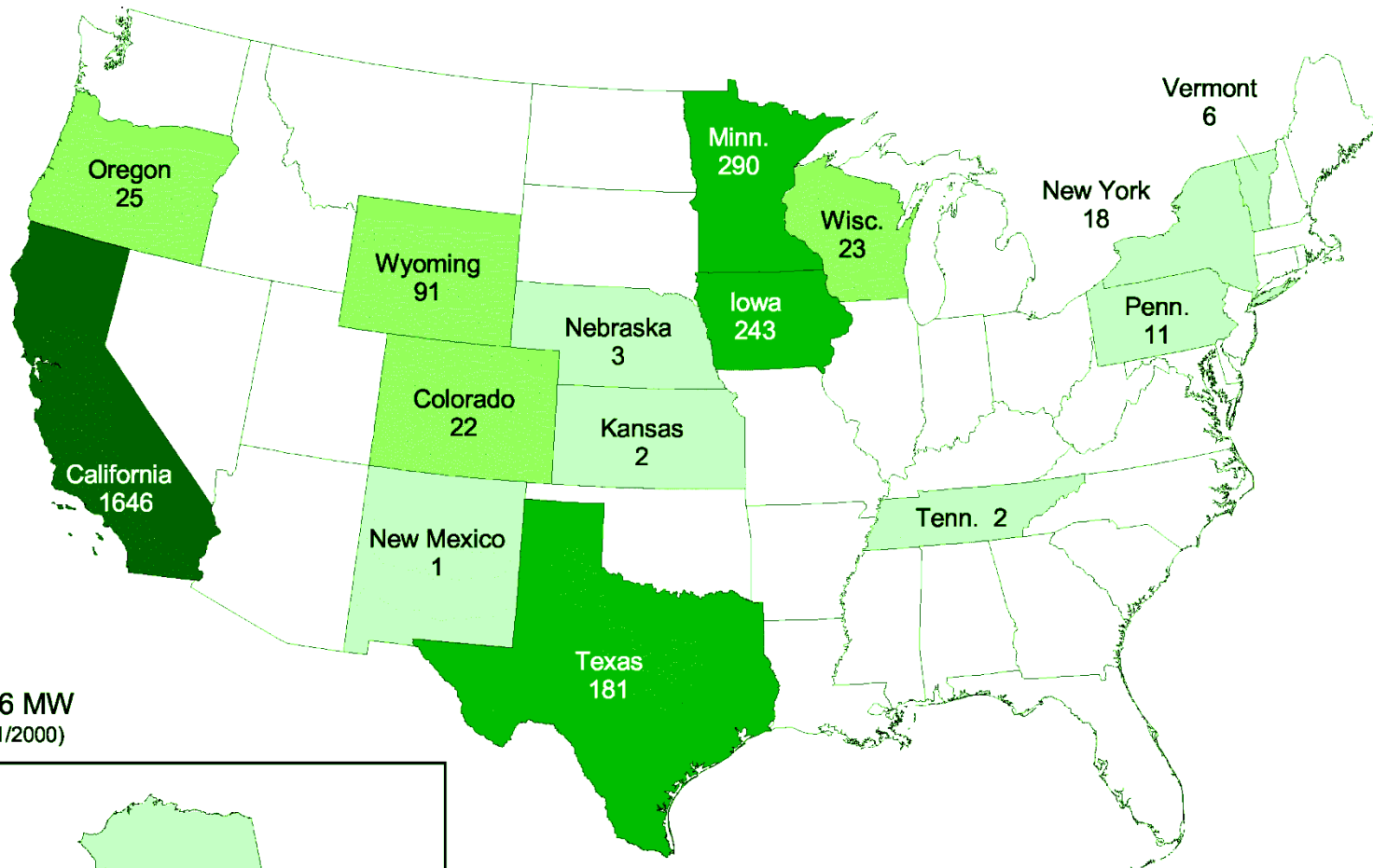


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National Renewable Energy Laboratory

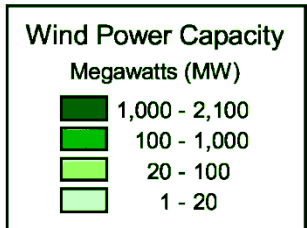


26-FEB-2004 1.1.18

United States - 2000 Year End Wind Power Capacity (MW)



Total: 2,566 MW
(Updated 12/31/2000)

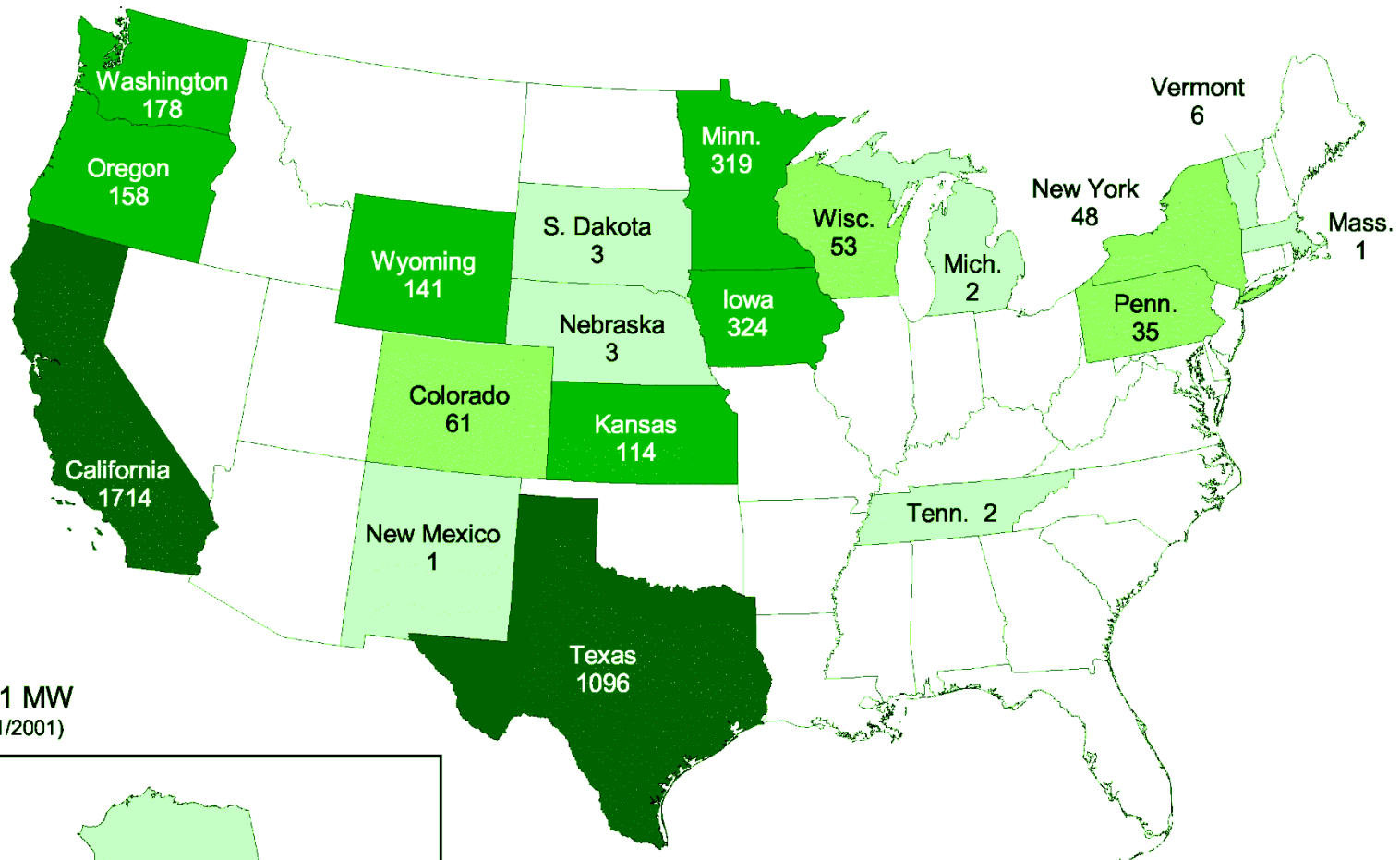


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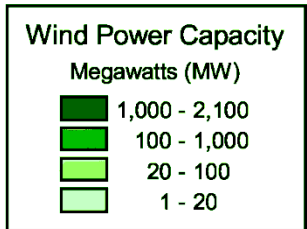
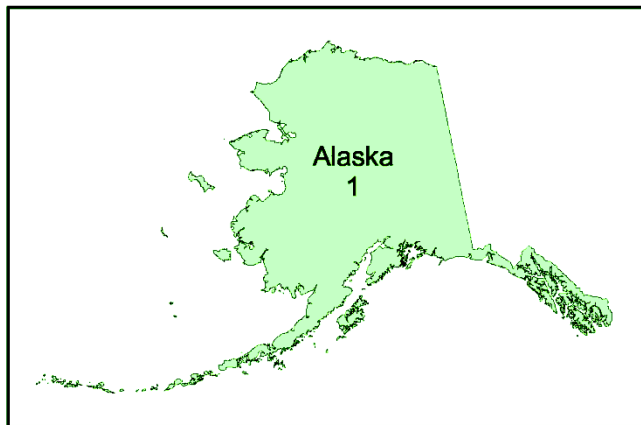


26-FEB-2004 1.1.17

United States - 2001 Year End Wind Power Capacity (MW)



Total: 4,261 MW
(Updated 12/31/2001)

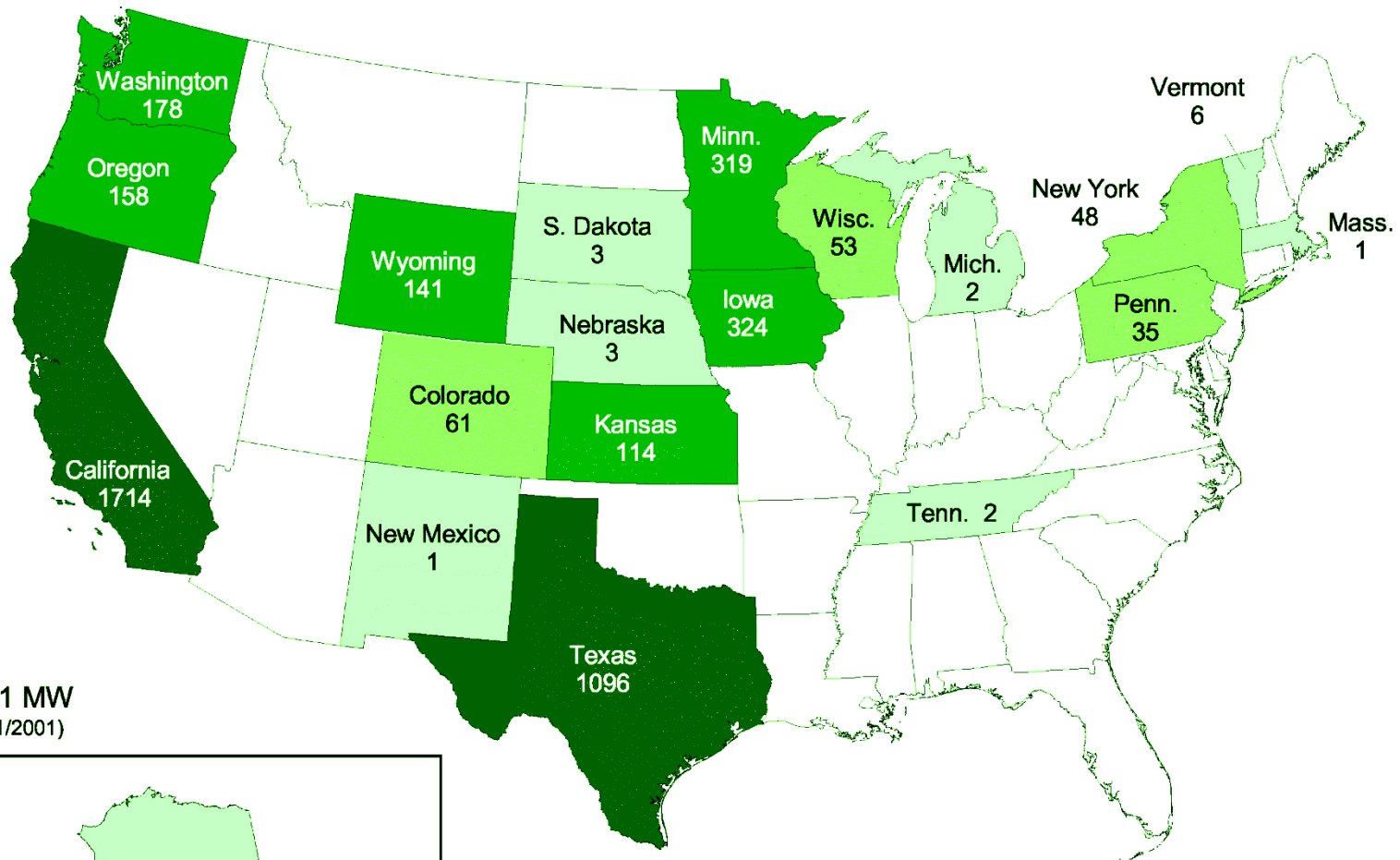


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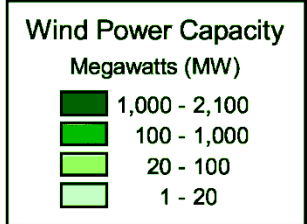
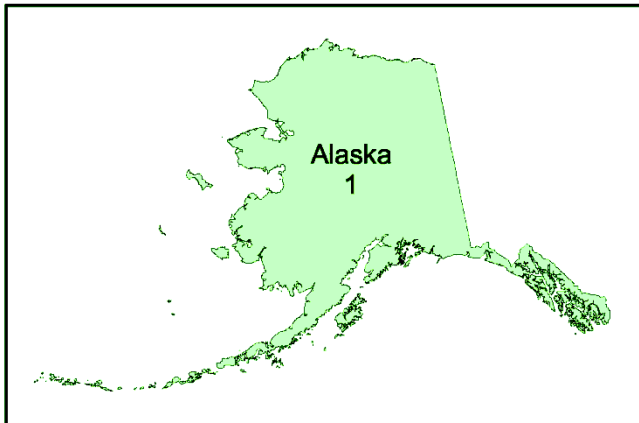


26-FEB-2004 1.1.16

United States - 2001 Year End Wind Power Capacity (MW)



Total: 4,261 MW
(Updated 12/31/2001)

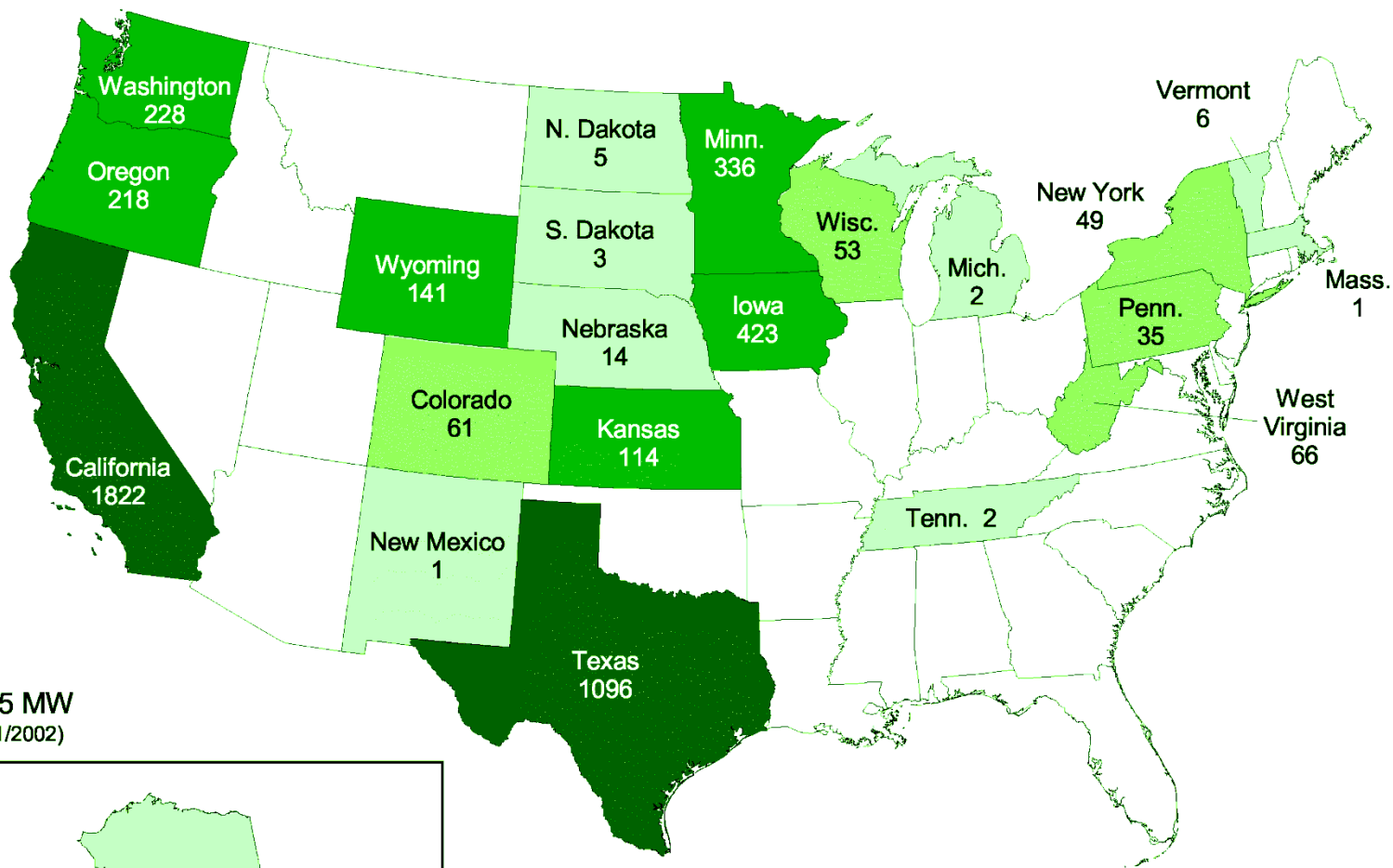


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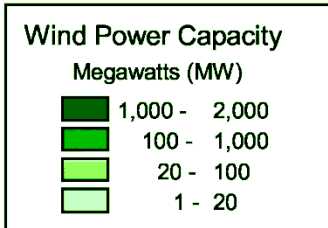
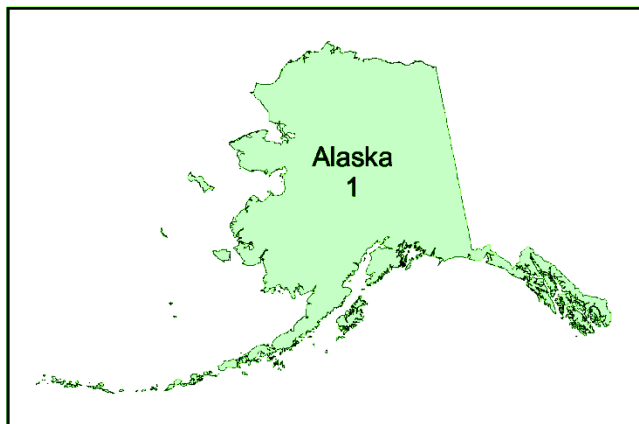


26-FEB-2004 1.1.16

United States - 2002 Year End Wind Power Capacity (MW)



Total: 4,685 MW
(Updated 12/31/2002)

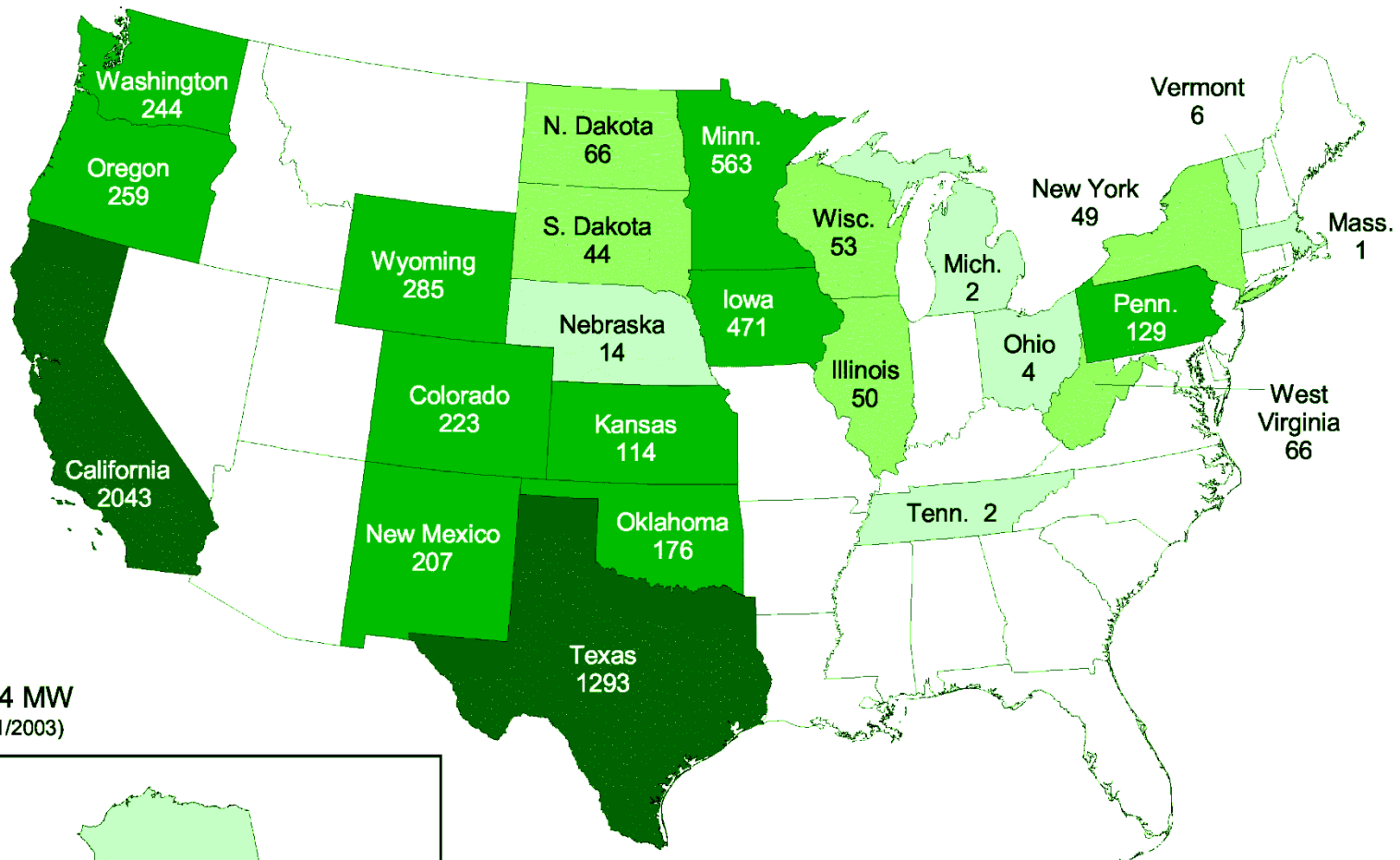


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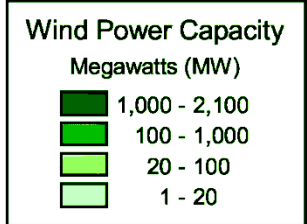


27-JAN-2003 1.1.13

United States - 2003 Year End Wind Power Capacity (MW)



Total: 6,374 MW
(Updated 12/31/2003)

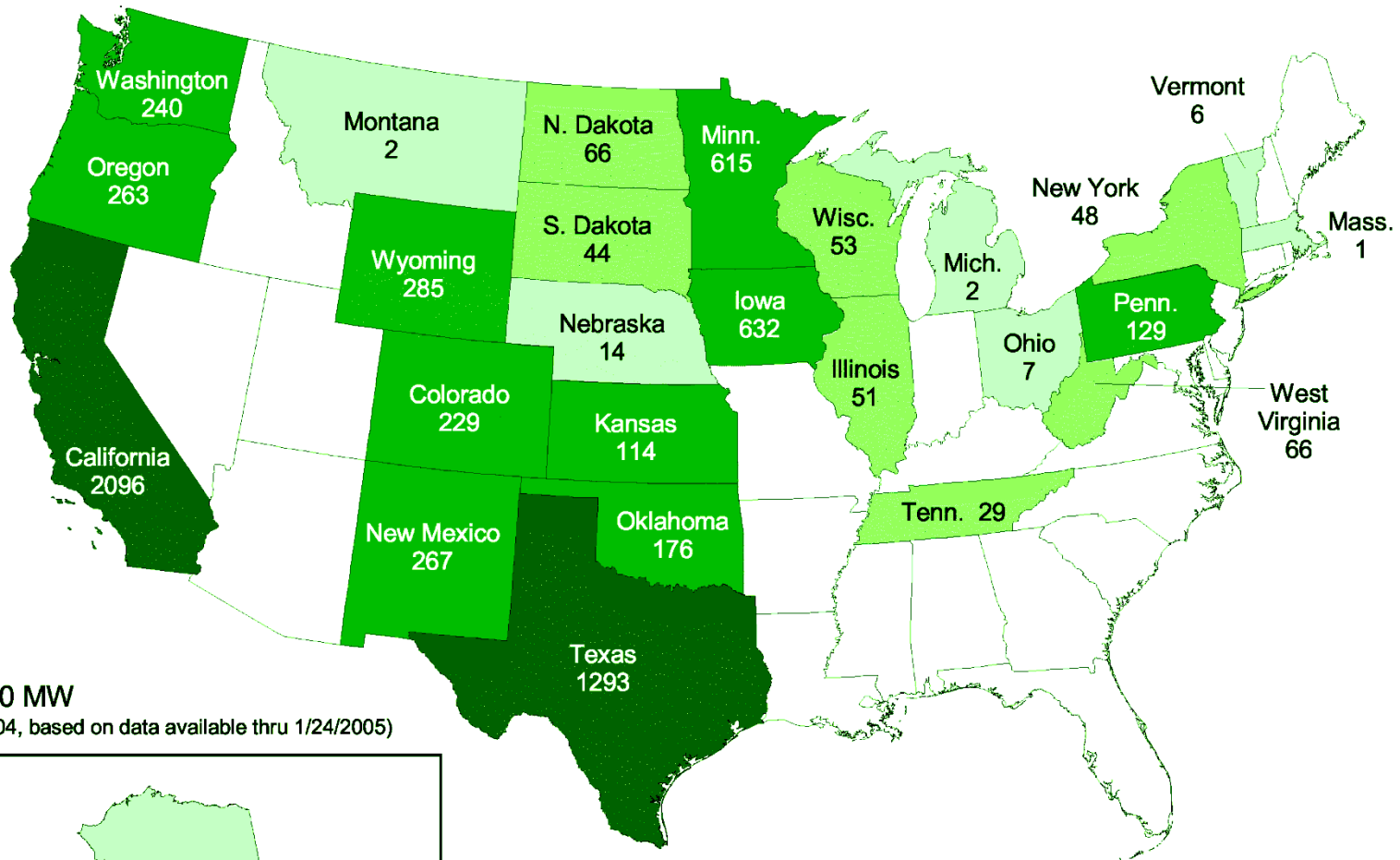


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15-JAN-2004 1.1.14

United States - 2004 Year End Wind Power Capacity (MW)



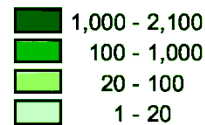
Total: 6,740 MW

(As of 12/31/2004, based on data available thru 1/24/2005)



Wind Power Capacity

Megawatts (MW)

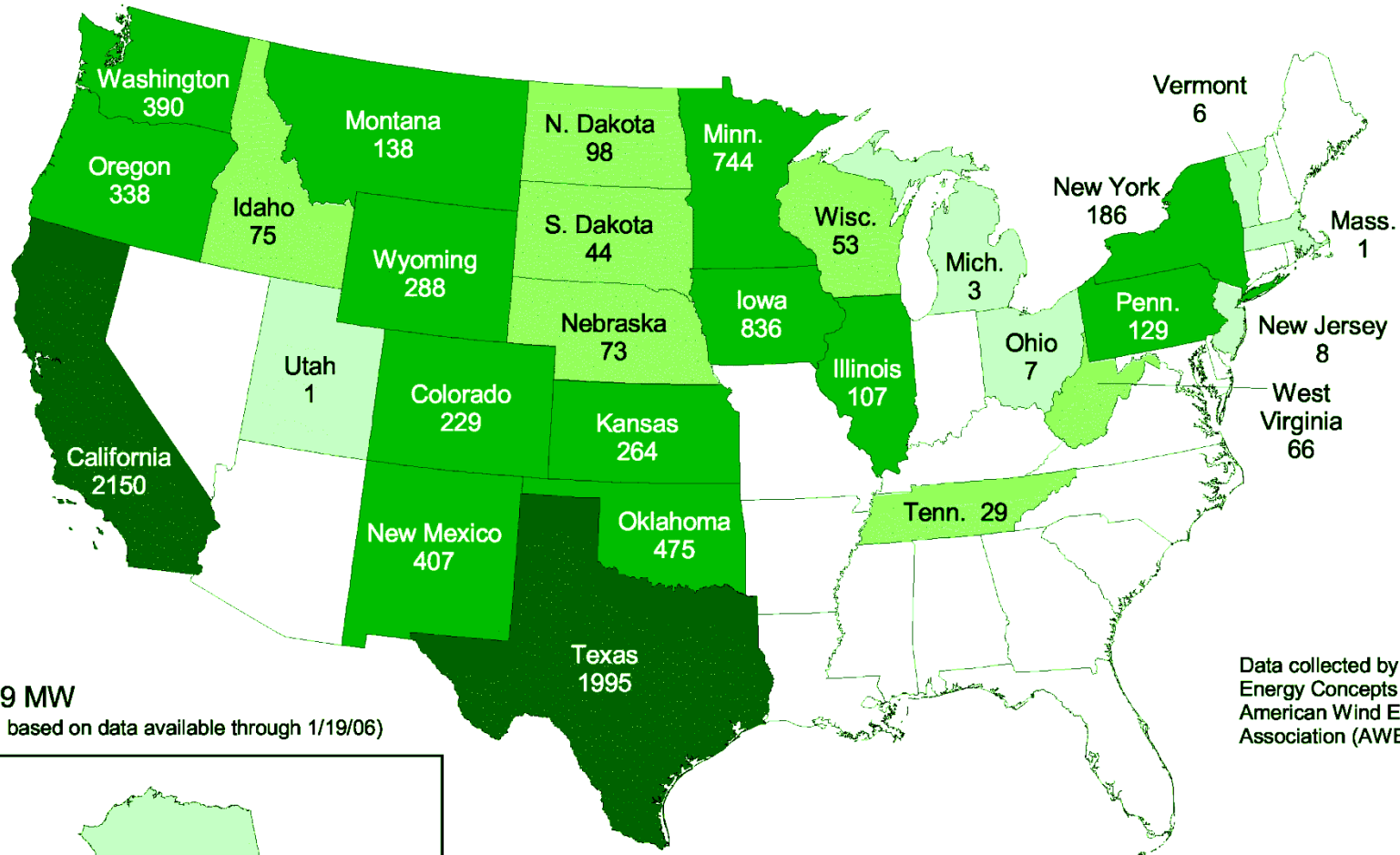


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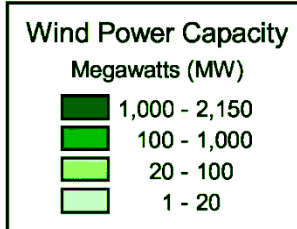
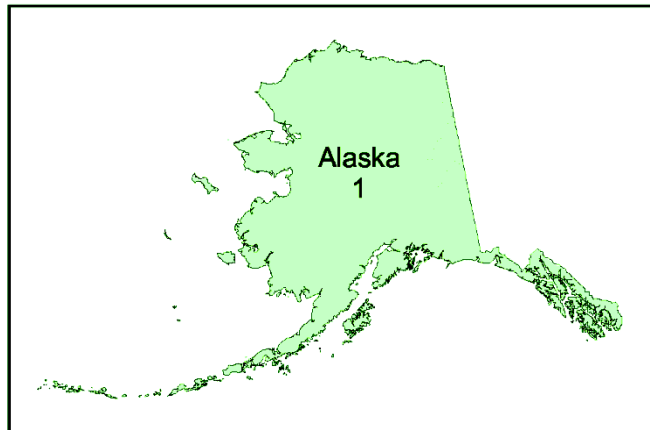
24-JAN-2005 1.1.20

United States - 2005 Year End Wind Power Capacity (MW)



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).

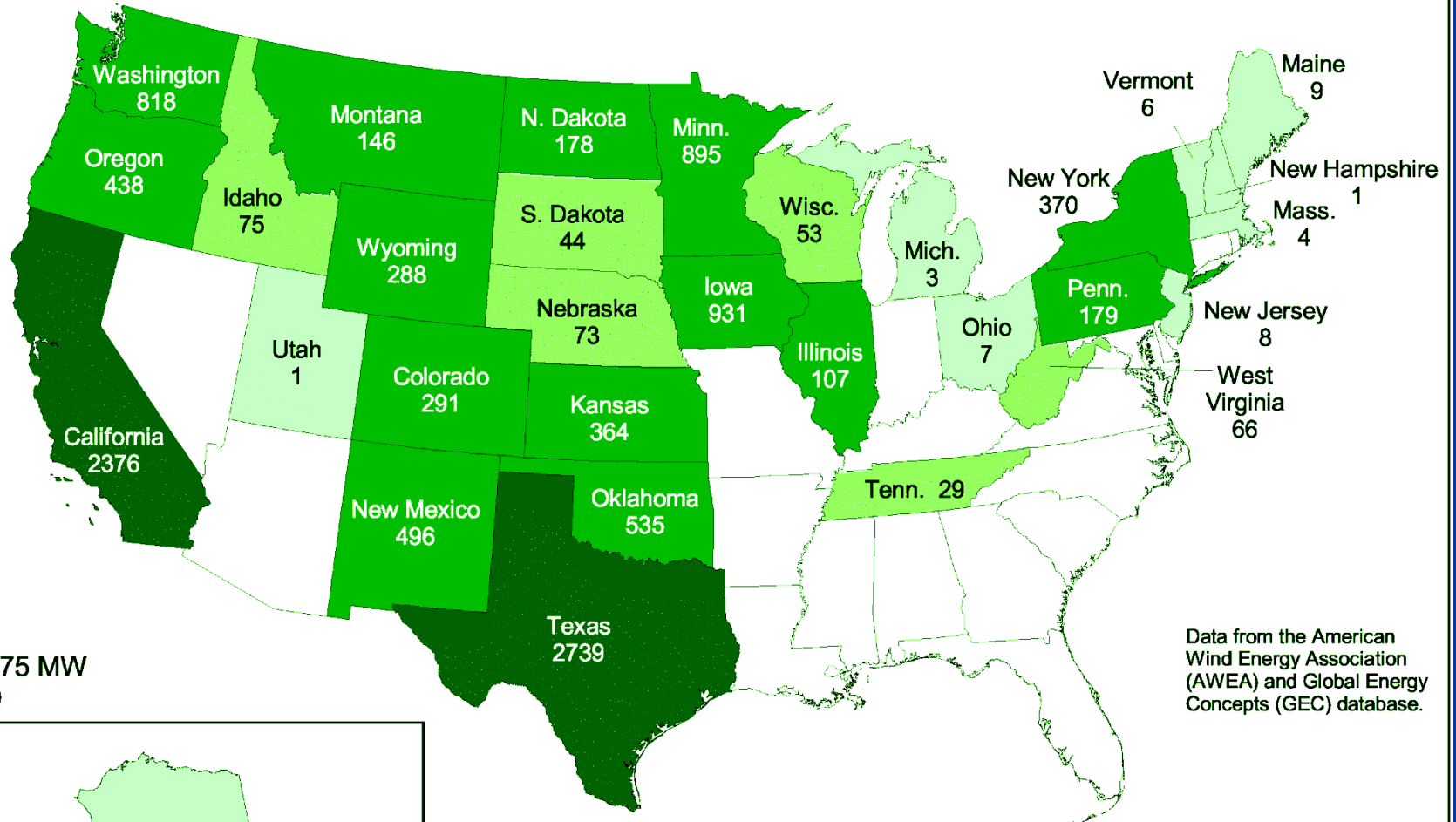


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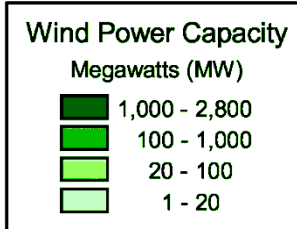
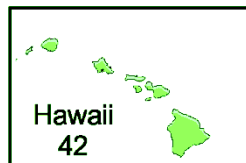
25-JAN-2006 1.1.22

United States - 2006 Year End Wind Power Capacity (MW)



Total: 11,575 MW
(As of 12/31/06)

Data from the American Wind Energy Association (AWEA) and Global Energy Concepts (GEC) database.

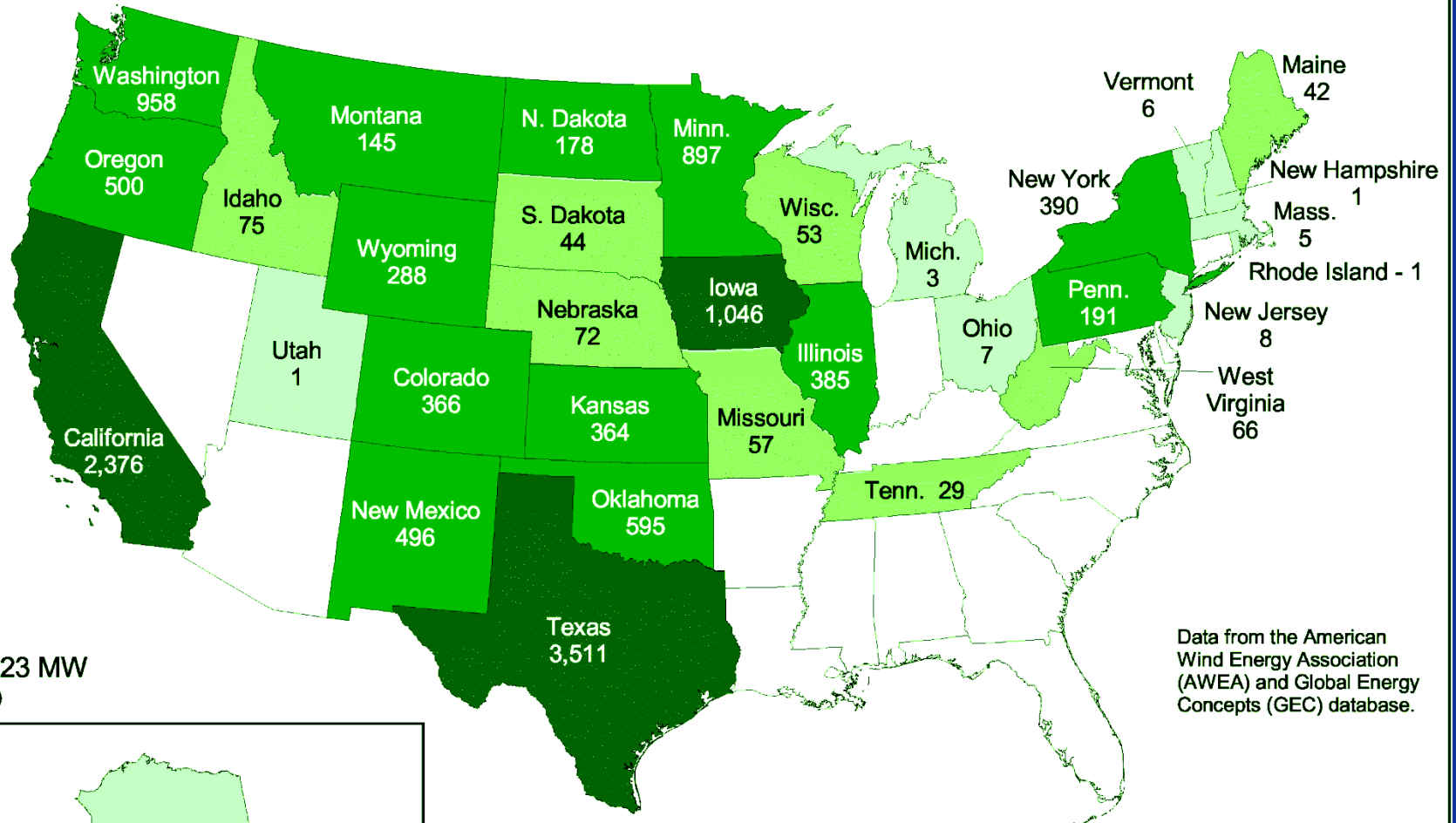


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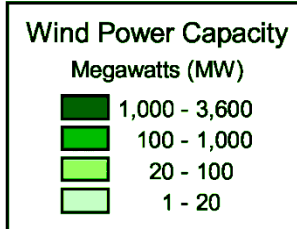
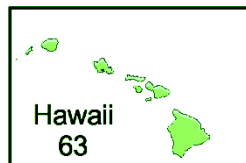
02-OCT-2007 1.1.26

United States - Current Installed Wind Power Capacity (MW)



Total: 13,223 MW
(As of 10/31/07)

Data from the American Wind Energy Association (AWEA) and Global Energy Concepts (GEC) database.



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13-NOV-2007 1.1.23

Pennsylvania

The background of the slide is a photograph of a wind farm at sunset. The sky is a mix of orange, yellow, and blue. The sun is low on the horizon, creating a bright glow and lens flare. Several wind turbines are silhouetted against the sky, with one in the foreground being the most prominent. The overall mood is serene and highlights renewable energy.

- Contributes 1% of Global Greenhouse Gases
- 1% of Carbon Wedge = 20,000 Megawatts Wind
- Demonstrated Capability of 5000 Megawatts Wind
- Currently 461 Megawatts of Wind Generation

Locust Ridge Wind Farm
Pennsylvania