Midsize Wind Markets

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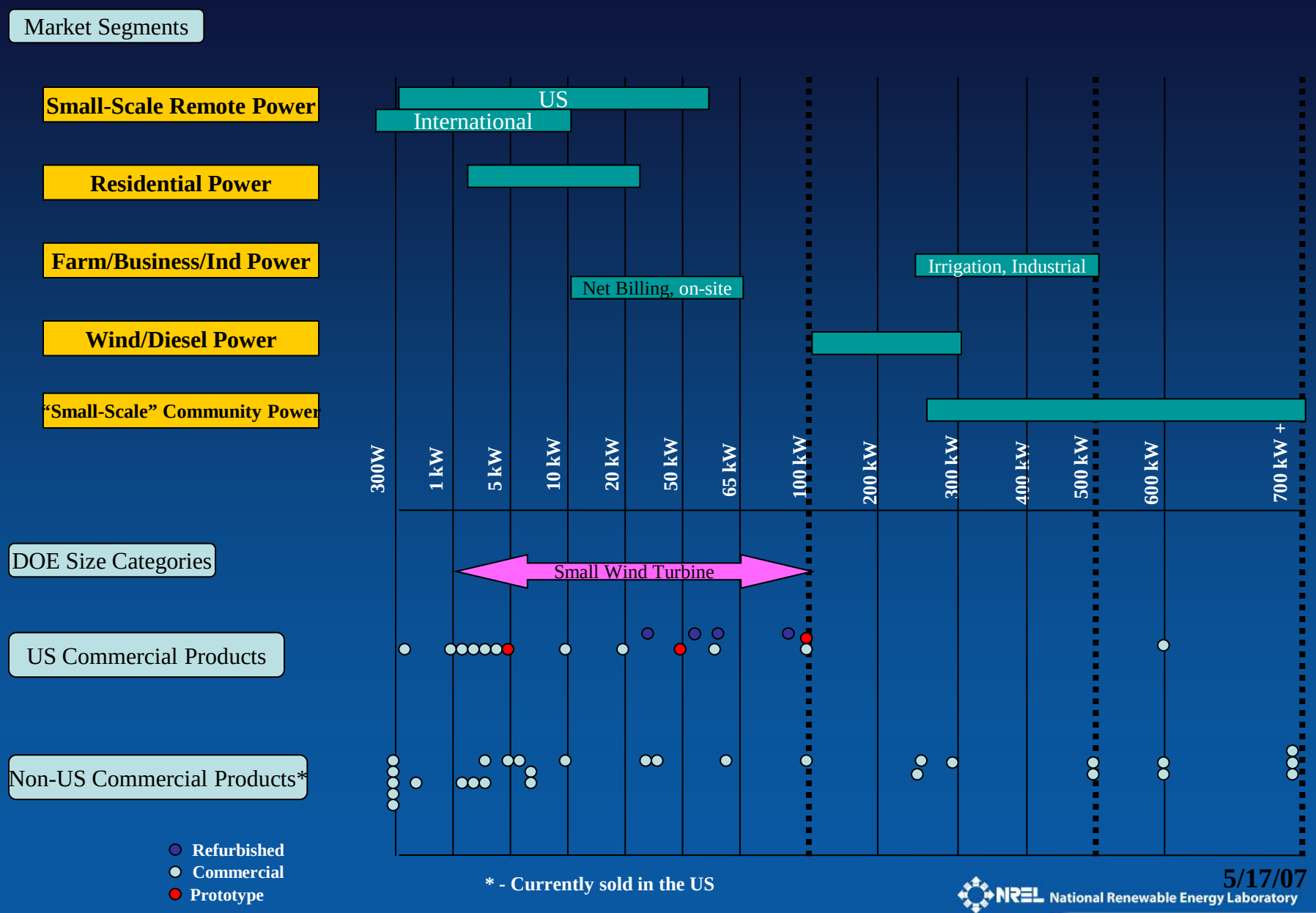
Overview

- Midsize Wind Markets
  - NREL Market Application Report Summary
  - ICF Market Assessment
    - Midsize Opportunities not captured by ICF Study
      - Irrigation/farm businesses
      - Federal/military installations (no further info)
      - Islands (no further info)
      - Wind/diesel – dominantly in AK (no further info)
  - ICF Market Approach
  - ICF Market Results
- Tom Wind's Project Development Requirements
- Tom Wind's Case Studies
- Current Net Metering Status

NREL Market Assessment Summary

Distributed Wind Market Applications http://www.nrel.gov/docs/fy08osti/39851.pdf



“Small Scale” Community Wind

- Key Market Barriers
  - Turbine availability
  - Economics
  - Interconnection
  - Permitting/Siting
- Key Technical Barriers
  - Grid interconnection and integration
  - Turbine and tower options
  - Installation and maintenance
  - Performance projections
- Domestic market potential estimated to be up to 4.5GW by 2020

ICF Analysis Approach

- ✓ Identified all the possible businesses/public entities by NACIS code
- ✓ Took number of employees as a basis for understanding electricity consumption
- ✓ Modeled existing mid-size turbines up to 1 MW and NREL turbines (fictious turbine models that represent new technology)
- ✓ Meshed the electricity production of the turbines and consumption of the businesses/public facilities based on
  - ✓ Wind Power Class 2 and NREL turbines
  - ✓ State incentives and net metering policies current as of June 2008
  - ✓ Excluded areas with high elevation and steep slopes
  - ✓ Excluded areas with a population density greater than 500 people/sq.mi.
- ✓ Modified future wholesale electric rates
  - ✓ EIA projection for 2009 inflated at same rate as retail rates.

ICF Analysis Approach

- ✓ Needed market payback as a function of market sector
  - ✓ Residential - 7-10 year
  - ✓ Commercial/Industrial – 1-5 year
  - ✓ Public Facility - 8-10 years

NREL Turbine Models

- 500 kW model based on Vestas V-39
  - 38% capacity factor
  - Max Cp = 0.50
  - $2,570 installed capital cost
- 250 kW model based on Fuhrlander FL250
  - 38% capacity factor
  - Max Cp = 0.50
  - $2,820 installed capital cost

ICF Analyses Findings: Winners for Commercial, Industrial and Public Facilities

- Existing Technology (1980s): **100 GW market potential**

Size of Turbine (kW)	10	50	250	500	750	1,000	2,000
# of Winners	12	6,538	2,403	8,004	15,390	27,031	50,858

- Projections based on improved technology
- Results: **119GW market potential**

Turbine	NREL 250	NREL 500
# of Winners	68,931	204,663

Full paper available at: http://www.nrel.gov/docs/fy09osti/44280.pdf

ICF Market Assessment Findings

- **Distributed wind can be successful**
  - Economic success is correlated with abundant wind, high market electricity rates, high REC prices, and strong policy support
  - Economies of scale are important
- **Better technology will lead to better economics**
  - Lower initial costs
  - Greater productivity, especially at low wind speeds
- **Policy support makes a major difference**
  - Federal tax incentives and State rebates/productivity incentives
  - Grants
  - REC policy and markets
- **Distributed wind can make a major contribution to the 20% goal with slower transmission build-up**

Midsize Wind Turbine Development Workshop

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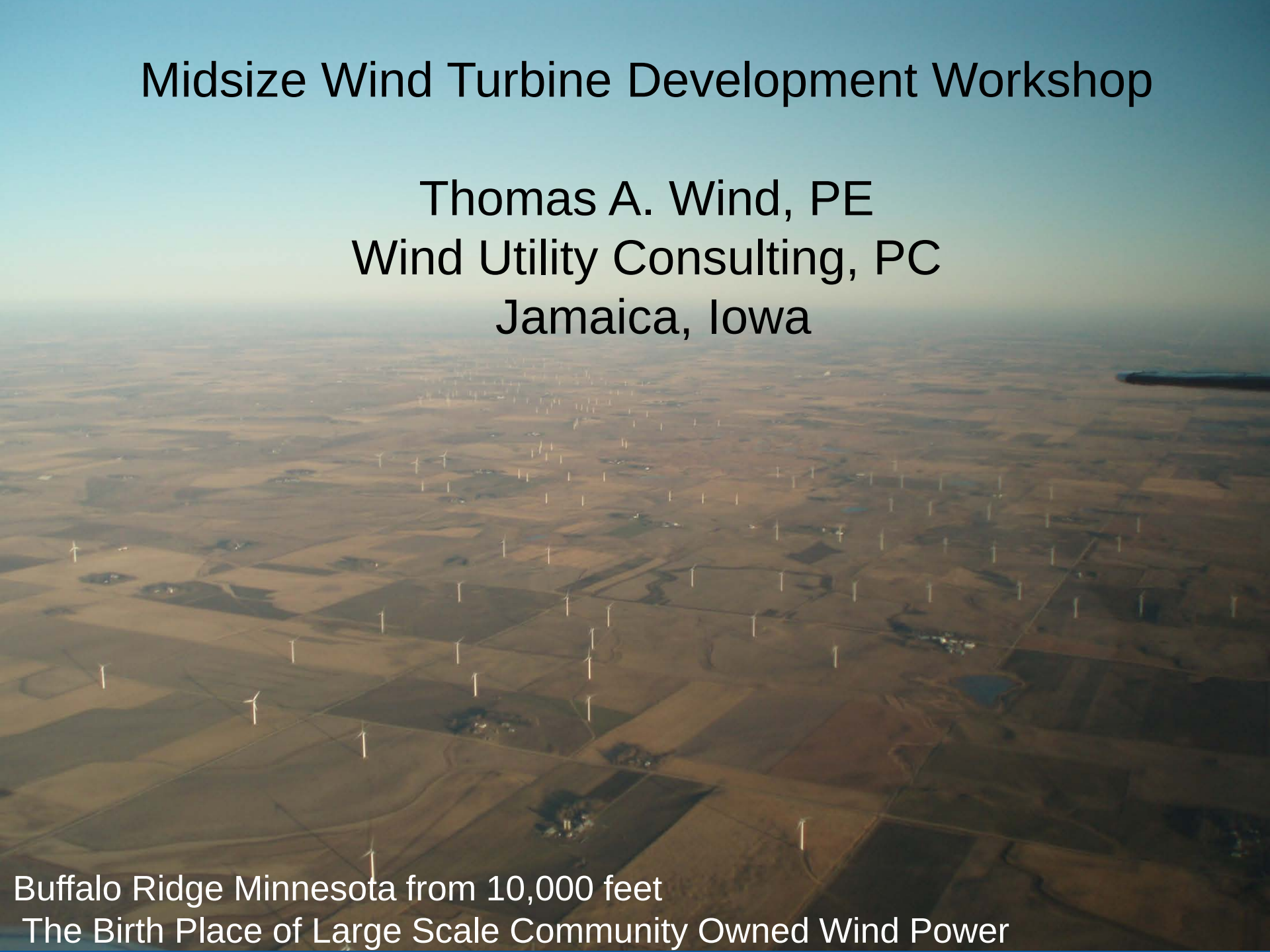
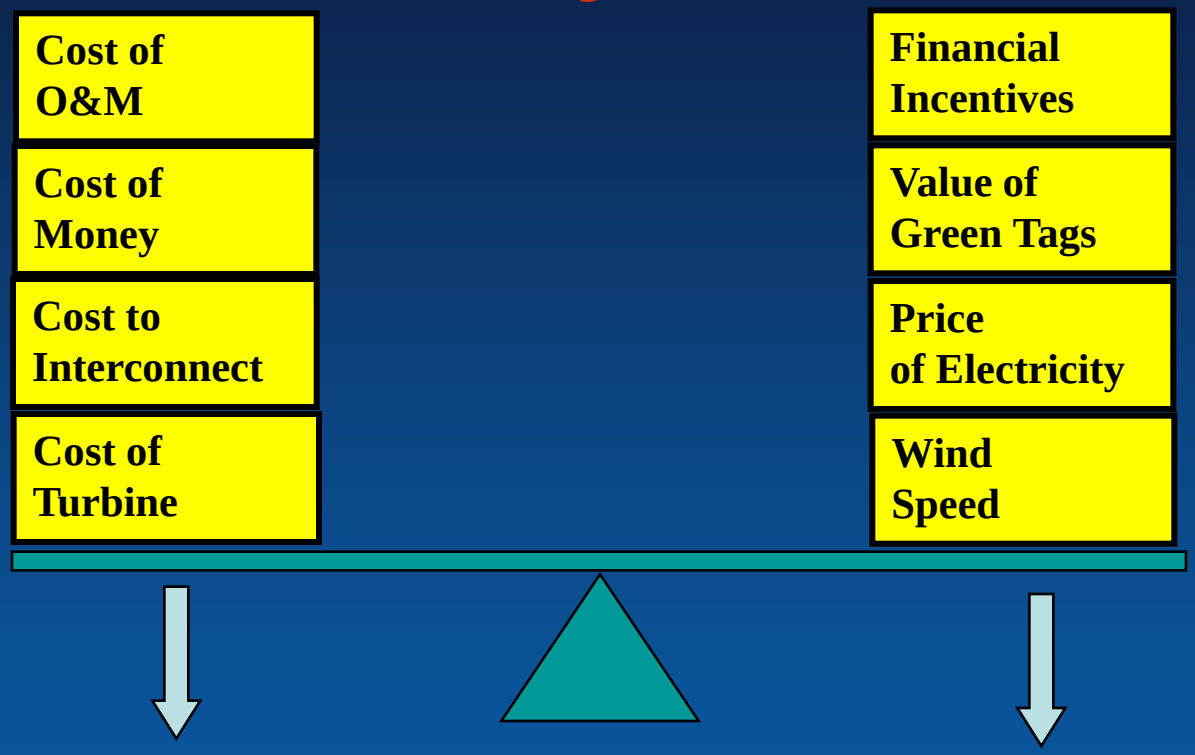
Wind Utility Consulting, PC
Jamaica, Iowa



Buffalo Ridge Minnesota from 10,000 feet
The Birth Place of Large Scale Community Owned Wind Power

The Overall Economics of Wind Generation is Determined by a Balance of Factors



Higher Values **DISCOURAGE** Wind Generation

Higher Values **FAVOR** Wind Generation

Typical Wind Project Development Process

This is not always a straight forward process and the steps are not always in this order.
Sometimes the steps are repeated in an iterative fashion to optimize the economics of the project

- Site Selection
- Land Agreements
- Wind Assessment
- Environmental Review
- Economic Modeling
- Interconnection Studies
- Permitting
- Sales Agreements
- Financing
- Turbine Procurement
- Construction Contracting
- Operations & Maintenance

Wind Turbines at Schools and Colleges

600 kW Wind Turbine for School at Forrest City Iowa

Wind Turbine Behind the Eldora-New Providence High School

- Twelve Iowa schools and colleges in Iowa, and five in Minnesota have wind turbines. All projects are the result of three major factors:

1) Supportive Public Policies
   - Net Metering
   - Grants
   - Low cost financing
   - Tradable state tax credits
   - Green tags or RECs
   - Administrative and technical support from state
2) Significant savings in power bills
3) Determined local champions who do not give up easily

Iowa Schools: Spirit Lake, Nevada, Sentral, Clay-Everly, Akron-Westfield, Forest City, Clarion, Eldora, Iowa Lakes Community College, Grinnell College

Minnesota Schools: Lac Qui Parle, Pipestone, Carleton College, St. Olaf, U of M at Morris

Wind Turbines at Farms

Farmer-owned 65 kW wind turbine in Southeast Iowa used for hog CAFOs

Farmer-owned 12.5 kW wind turbine in Southern Minnesota

Farmer-owned 1500 kW wind turbine by Armstrong, Iowa

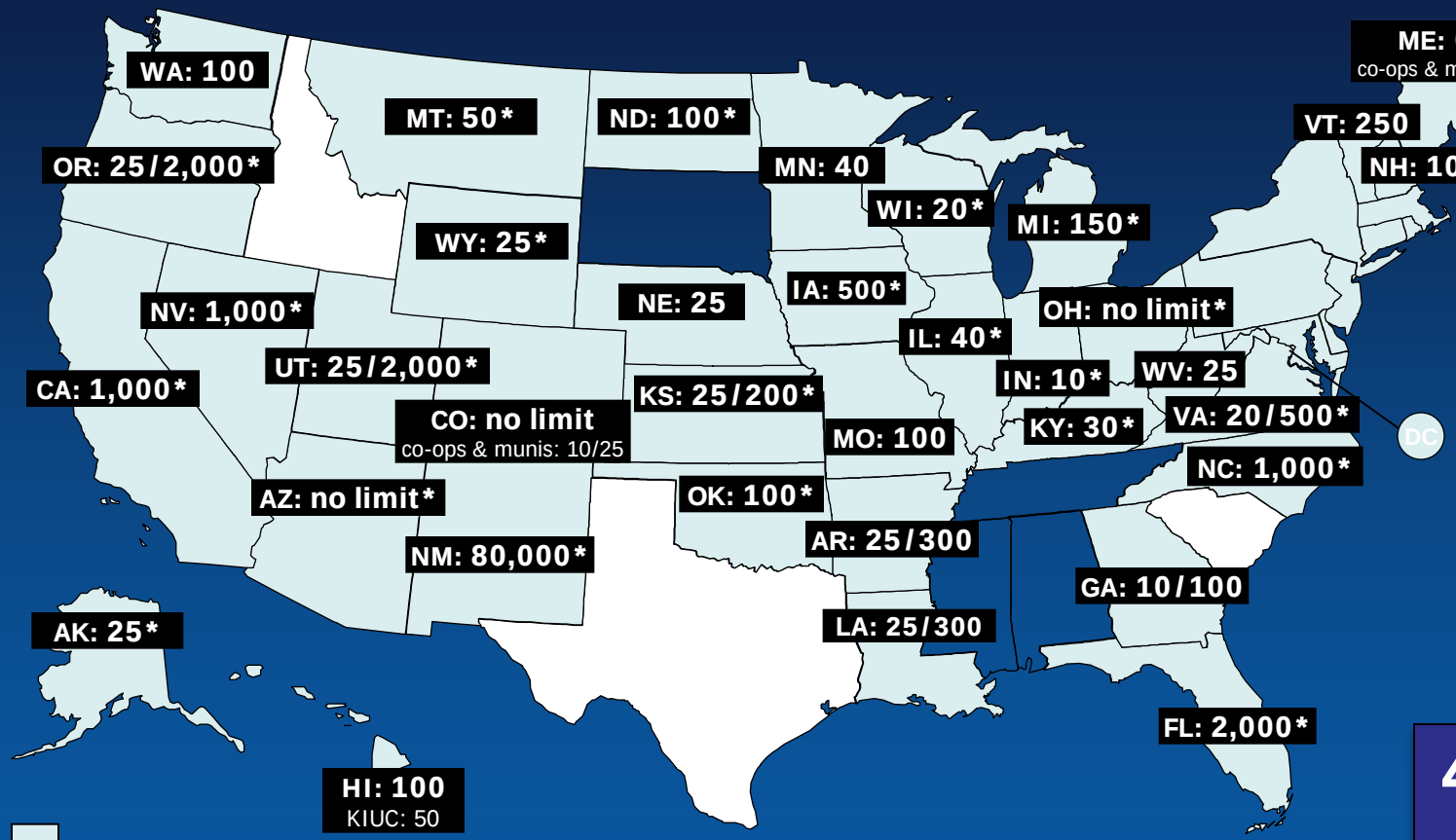
- Wind turbines can be installed at farms to offset electricity purchases from the local utility
- The economics depend in large part on the availability of net metering and the use of a single part electric rate (no demand charge)
- The economics are generally not favorable for very large agricultural facilities to use wind generation due to two part rates and the lack of net metering for large facilities
- Farmer-owned 1500 kW wind turbine by Armstrong, Iowa sells all power to utility rather than using it for large nearby hog farrowing operation

Wind Turbines at Businesses

- Wind turbines can be installed by businesses to offset electricity purchases from the local utility
- Again, the economics depend in large part on the availability of net metering and the use of a single part electric rate (no demand charge)
- The economics are generally not attractive for most businesses since most large businesses require relatively short payback periods for capital investments
- Smaller family-owned businesses that have a keen interest in renewable energy are more likely to justify the longer payback periods in excess of 7 to 10 years

Net Metering

www.dsireusa.org / April 2010



43 states + DC & PR have adopted a net metering policy

State policy

Voluntary utility program(s) only

* State policy applies to certain utility types only (e.g., investor-owned utilities)

Note: Numbers indicate individual system capacity limit in kW. Some limits vary by customer type, technology and/or application. Other limits might also apply.

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Midsize Distributed Wind Can Make a Significant Contribution to the 20% by 2030 Goal