National Renewable Energy Laboratory
Innovation for Our Energy Future

Market Assessment Distributed Wind Technologies (DWT)

NREL

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Photo by Tom Wind

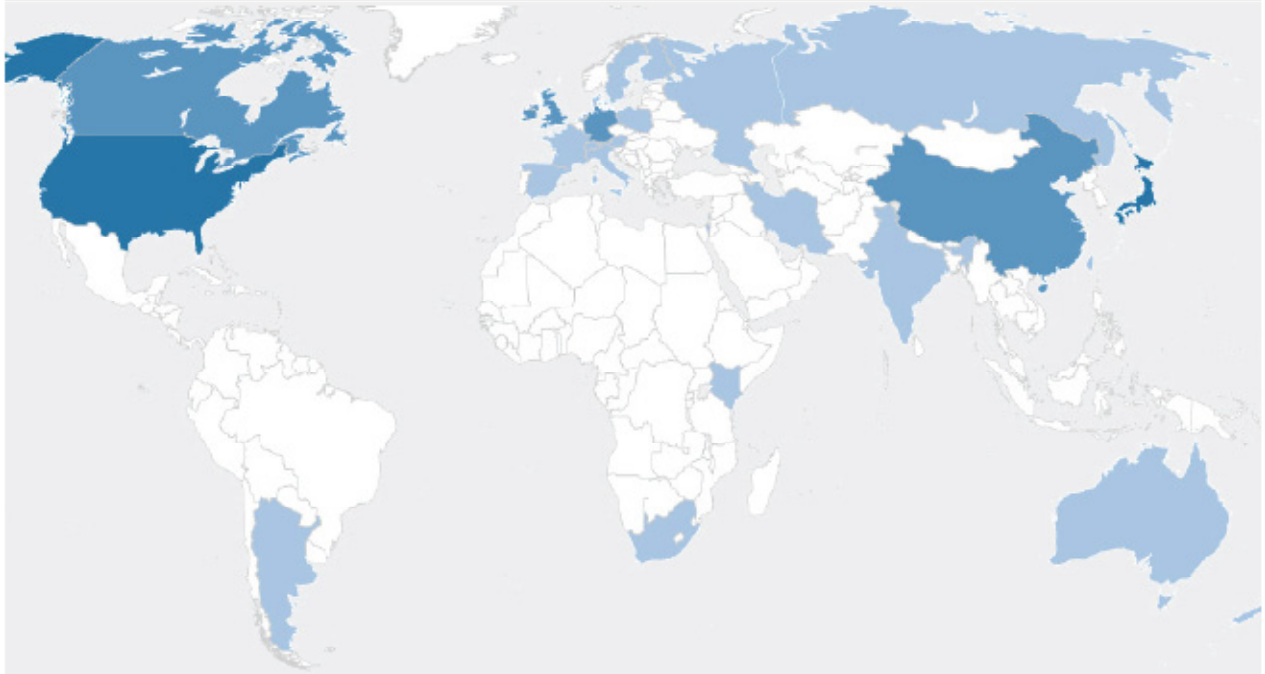
Presentation Overview

- Global small wind turbine market (200m^2 or less)
- US Small wind incentives (100 kW and less)
- AWEA Global Market Report summaries
- US Midsize wind market (100 kW to 1 MW)

Global Small Wind Markets

- Small Wind Turbine Standard Involvement, IEC 61400-2
  - 3rd revision – 15 countries (AU, CH, CN, DE, DN, ES, FR, GR, IS, IT, JP, KR, SW, UK, US)
    - 2009 - present
  - 2nd revision – 6 countries (AU, FR, JP, GR, NL, US)
    - 1999-2002

FIGURE 10: GLOBAL DISTRIBUTION OF MANUFACTURERS



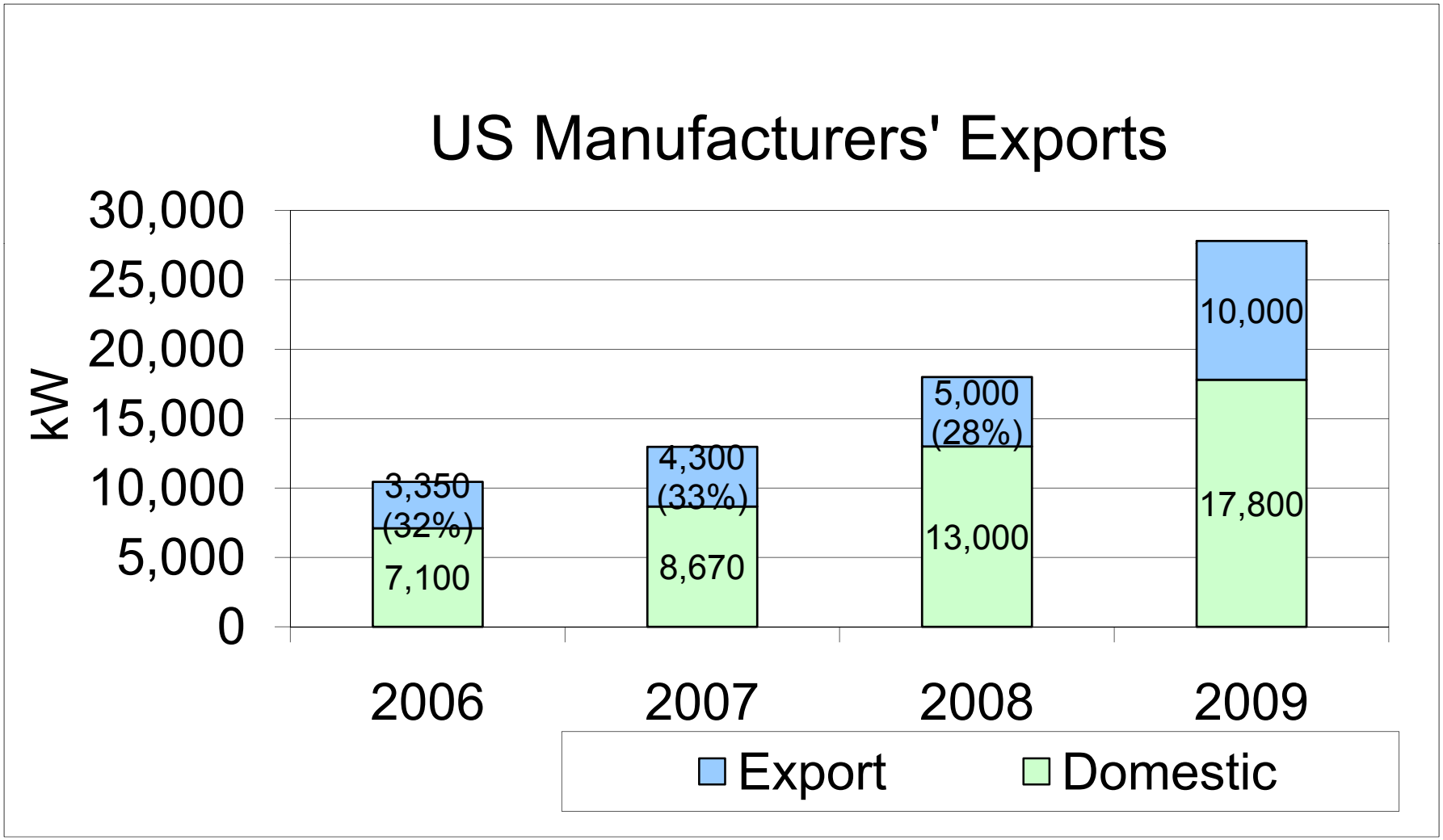
Country (Number of Manufacturers)			
US (66)	Sweden (5)	Israel (2)	Iran (1)
Japan (20)	South Africa (4)	Italy (2)	Kenya (1)
Canada (23)	Spain (4)	Russia (2)	Poland (1)
UK (18)	India (3)	Argentina (1)	New Zealand (1)
Germany (16)	Taiwan (3)	Australia (1)	Switzerland (1)
China (14)	Finland (2)	Austria (1)	
Netherlands (7)	France (2)	Denmark (1)	

Global Small Wind Market Leadership

- China leads on numbers of installed units – approximately 400,000
- US leads on installed MW in the ground – approximately
  - US = 100MW (100,000 cum installations)
  - China = 600MW (assuming 1.5 kW turbine average size)
- UK is 3rd on the list but have aggressive policy environment
  - Feed-in Tariff
    - 20 year contract, payment on all electricity 40 cents/kWh
    - 50 kW of wind turbines per project

Global Small Wind Market Trends

AWEA Global Market Report



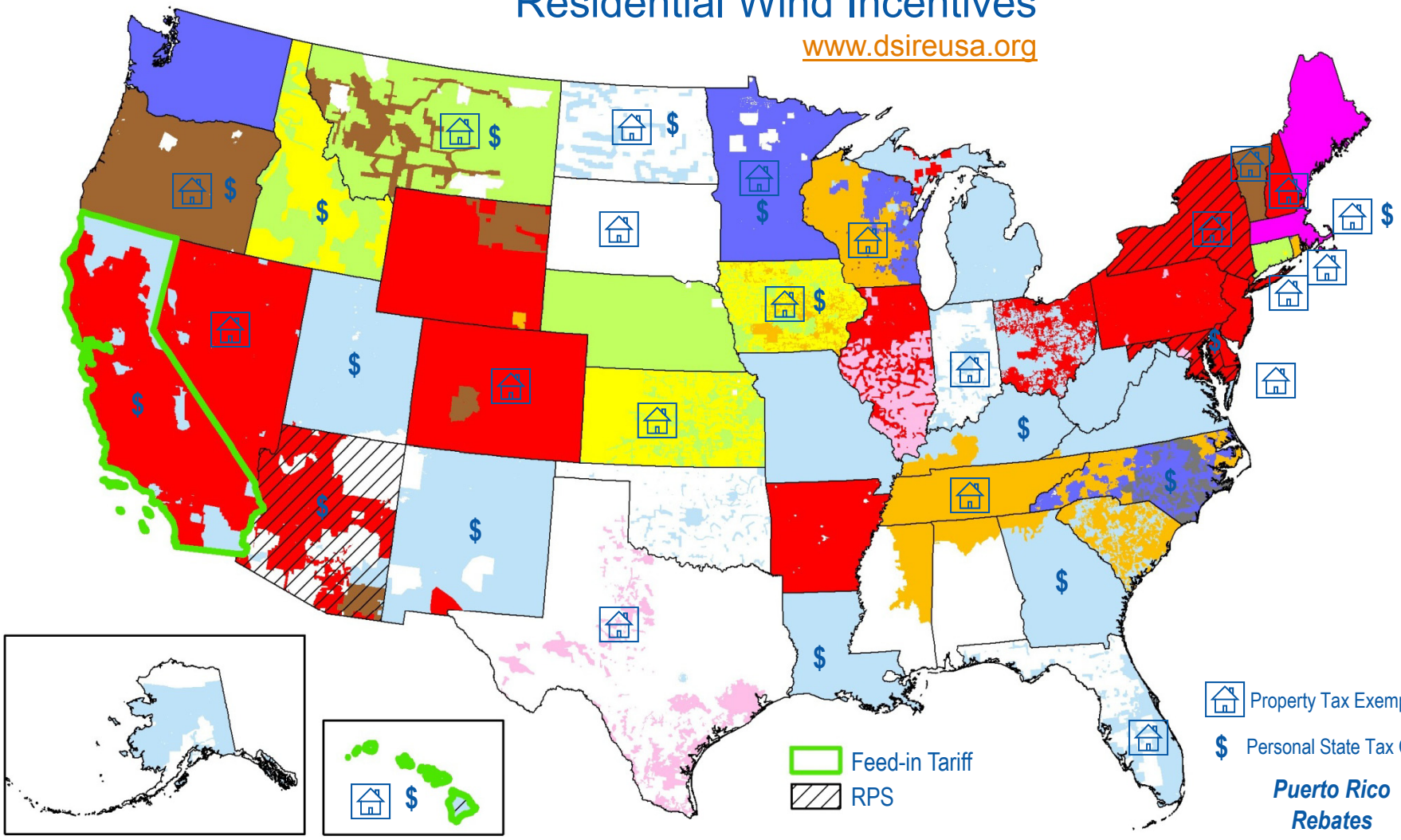
Global Small Wind Market Trends

AWEA Global Market Report

Top Five Manufacturers in 2009, in kW Sold		
Company	Country	kW Sold in 2009
Southwest Windpower	US (AZ)	11,700
Northern Power Systems	US (VT)	9,200
Proven Energy	UK (Scotland)	3,700
Wind Energy Solutions	Netherlands	3,700
Bergey WindPower Co.	US (OK)	2,100

Residential Wind Incentives

www.dsireusa.org



BUYDOWNS/GRANTS

- Buydown/Grants
- Buydown/Grants & Net Metering
- Buydown/Grants, Net Metering, & Loans
- Buydown/Grants, Net Metering, & Prod. Inc.

PRODUCTIVITY INCENTIVES

- Productivity Incentives & Loans
- Productivity Incentives
- Net Metering, Loans & Prod. Incentives
- Net Metering & Prod. Incentives

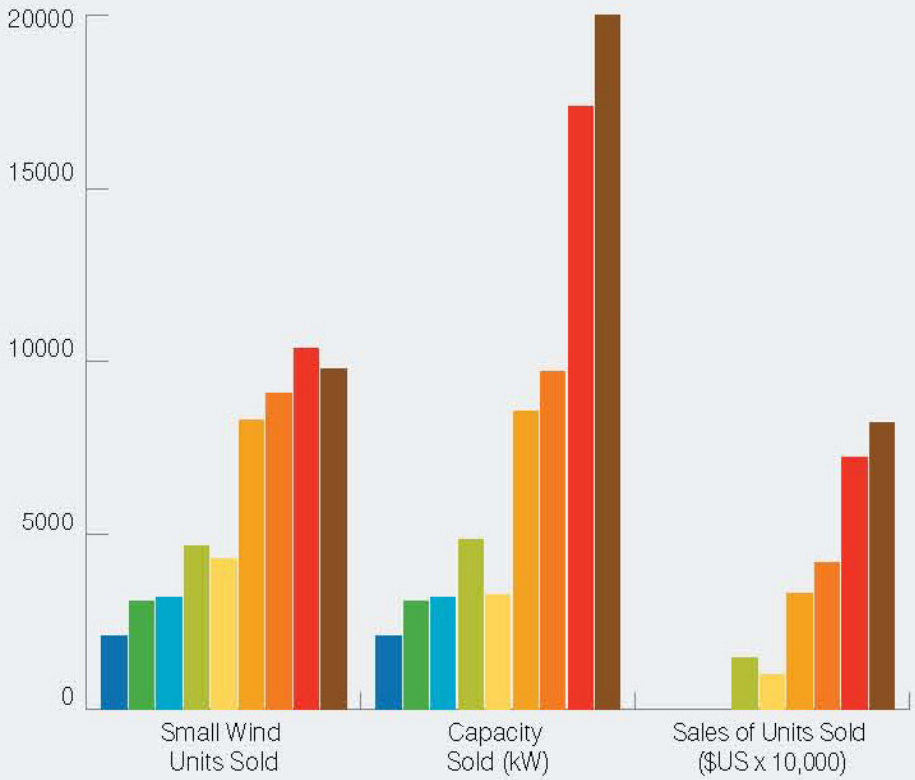
MINOR INCENTIVES

- Loans
- Net Metering & Loans
- Net Metering

Federal Investment Tax Credits are available for turbines 100 kW and less.

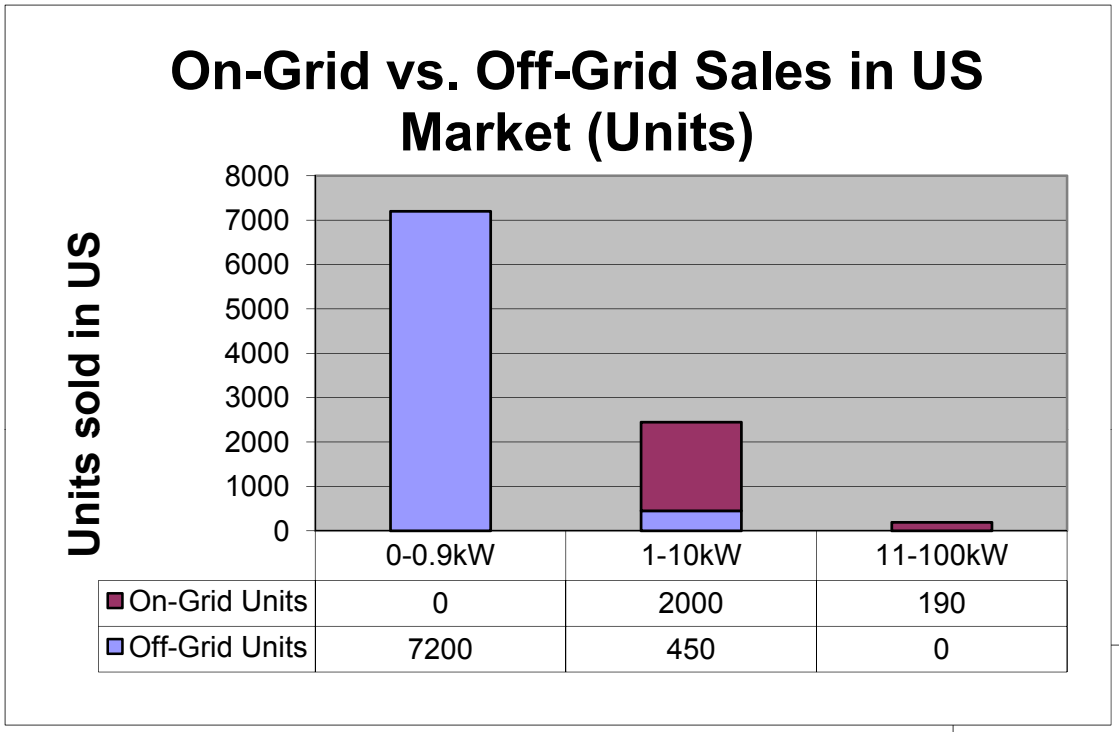
May 11, 2010

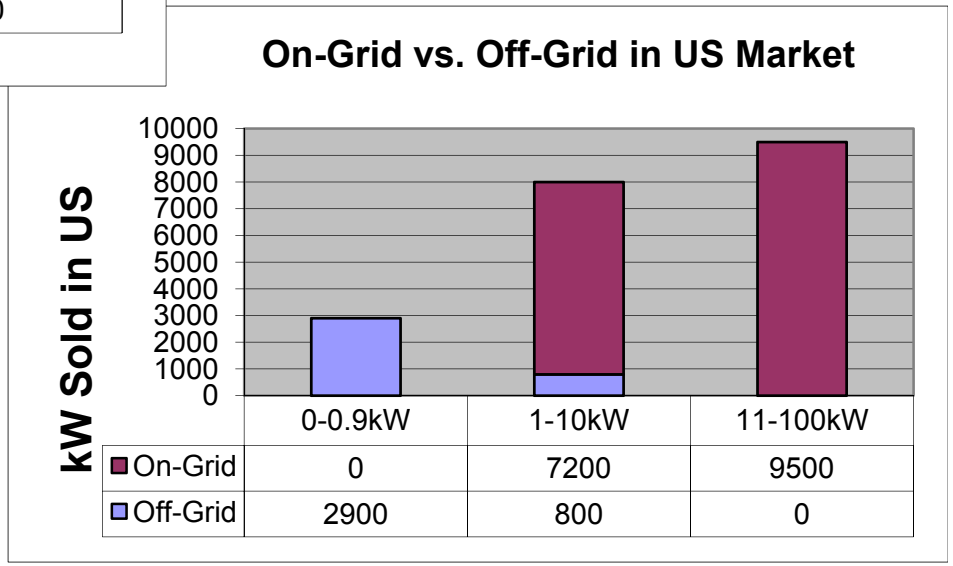
Growth of U.S. Small Wind Market



Year	Units	kW	Sales $US
2001	2,100	2,100	(not avail.)
2002	3,100	3,100	(not avail.)
2003	3,200	3,200	(not avail.)
2004	4,671	4,878	$1,489
2005	4,324	3,285	$990
2006	8,329	8,565	$3,320
2007	9,092	9,737	$4,197
2008	10,386	17,374	$7,266
2009	9,800	20,300	$8,240

Growth of U.S. Small Wind Market





AWEA AMERICAN WIND ENERGY ASSOCIATION

WIND: POWERING A CLEANER, STRONGER AMERICA | WWW.AWEA.ORG

SALES OF SMALL WIND TURBINES UP IN 2009

U.S. Market Prospers Thanks to Incentives, Investment, Popular Demand

Among key findings of the study:

- The U.S. small wind turbine market grew 15% in 2009, with 9,800 units sold and 20.3 megawatts (MW) of new generating capacity;

- The U.S. market is the world's largest -- about half of all units and capacity added worldwide in 2009;

- The U.S. is the world's leading manufacturer of small wind turbines: about two-thirds of all small wind systems sold in the world last year were made by U.S. manufacturers.

- Federal Investment Tax Credit (ITC) for small wind turbines in 2009, allowing consumers to take 30% of the total cost of a small wind system as a tax credit. The ITC was perhaps the most important factor in last year's small wind turbine market growth.
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- In 2009—during the height of the economic recession--$80 million of private equity was invested into small wind turbine manufacturing companies, boosting to over $250 million the total equity invested over the past five years.

For a copy of the full report see
http://www.awea.org/smallwind/pdf/2010_AWEA_Small_Wind_Turbine_Global_Market_Study.pdf

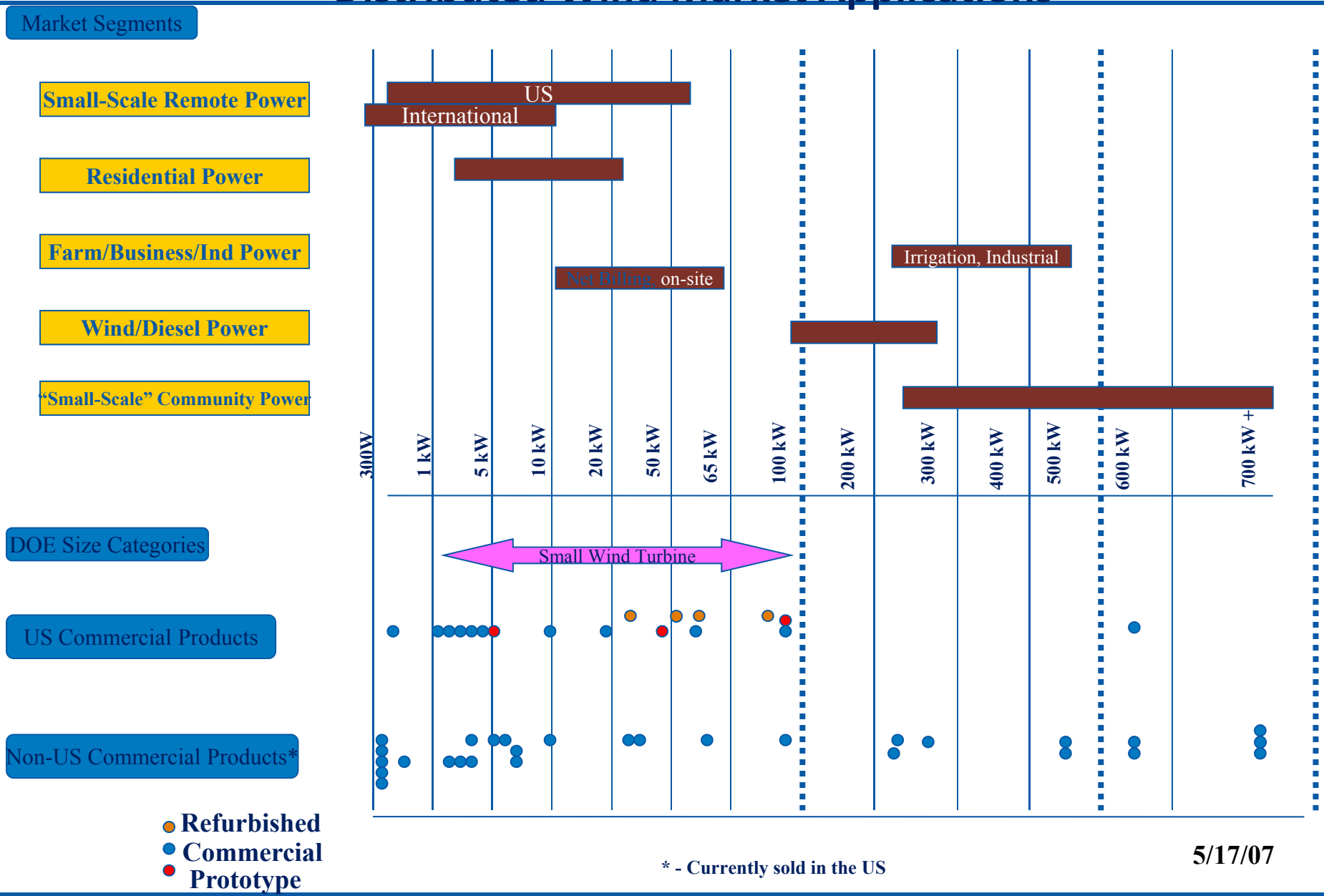
Midsize Turbine Opportunities

- Completed two market assessment studies

- **Distributed Wind Market Applications**
  - http://www.nrel.gov/docs/fy08osti/39851.pdf
    - Barriers – turbine availability, economics and interconnection

- **Analysis of the Technical and Economic Potential for Mid-Scale Distributed Wind: December 2007 - October 31, 2008**
  - http://www.nrel.gov/docs/fy09osti/44280.pdf
    - 119 GW potential for old technology
    - 100 GW potential for new technology

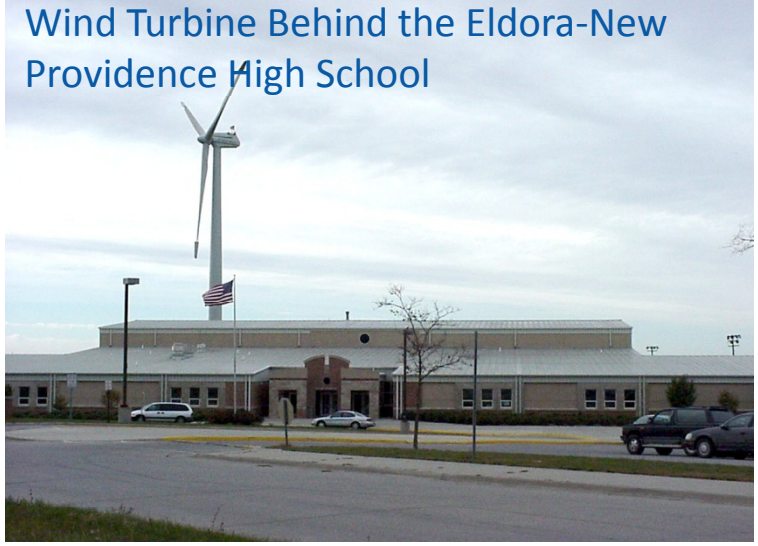
NREL Market Assessment Summary
Distributed Wind Market Applications



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


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

Near-term DWT activities

- Small Wind Turbines up to 100 kW
  - Many manufacturers developing new longer blades to increase production
  - Many manufacturers are getting their turbines tested/certified if under 16m or 200m^2 standard limits

- Midsize wind turbines 100 kW to 1 MW
  - Look for new DOE funded technology development
  - NREL/SNL workshops and market assessments have stimulated manufacturers to provide turbines in this size range
    - Some from EU
    - Some from US
    - If selling in US market will be looking to outsource towers due to shipping costs and possibly other components

Carpe Ventem