



Overview of Small Wind Turbines

Trudy Forsyth

Trudy_forsyth@nrel.gov

May 2008



Presentation Overview

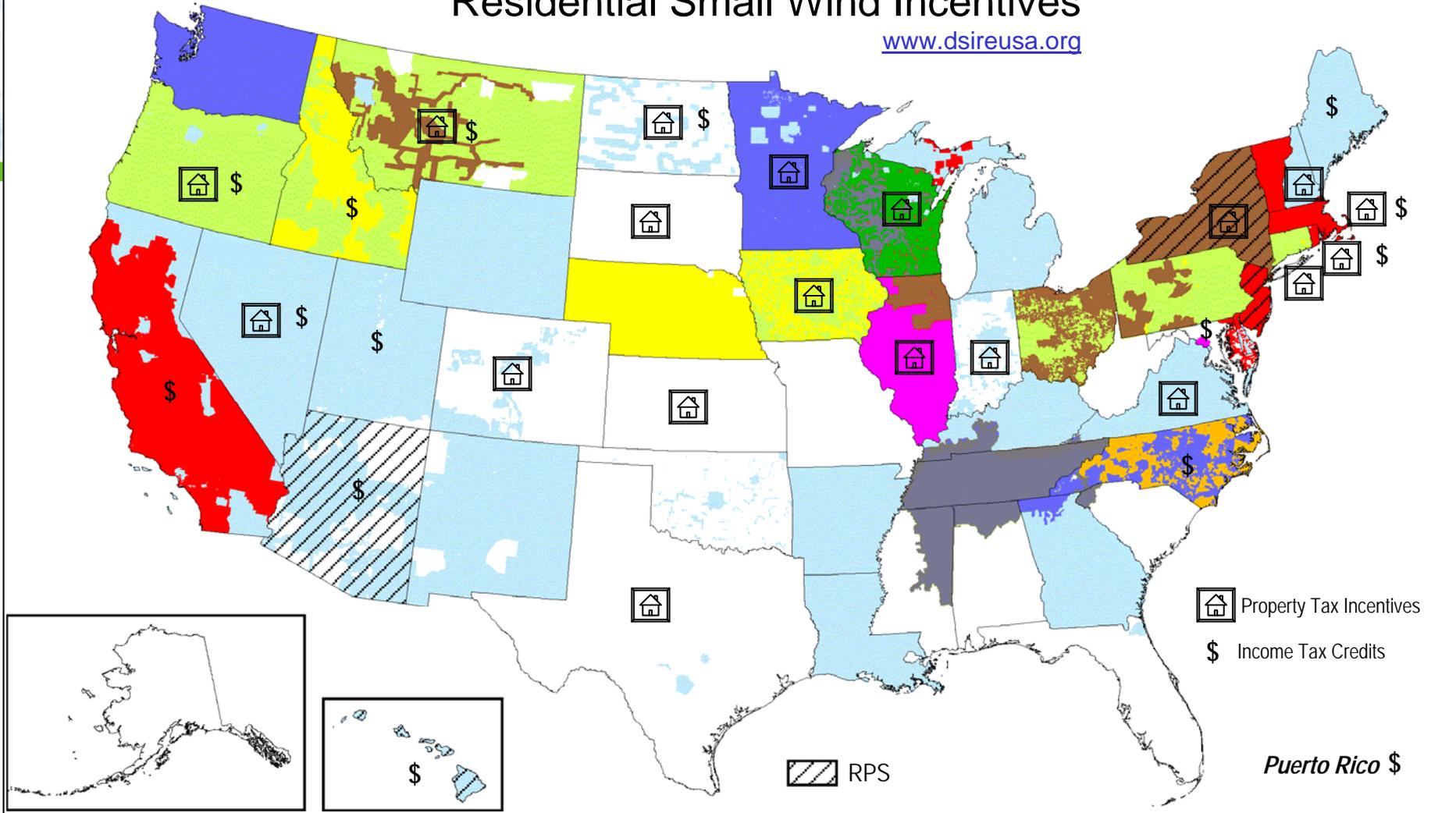
- DW Goal
- Residential policy
- Small wind market information
- Summary of AWEA Global Market Report
- Market diffusion theory and real application
- Summary of recent Distributed Wind Application Report

DOE/NREL DW Overview

- Goal: By 2015, the market for distributed wind technologies will be expanded five-fold from a 2007 baseline.
 - This five-fold increase will be accomplished through the removal of technology, market, and implementation barriers for small wind technologies.
 - Assumes 22% per year compounding
 - AWEA data shows market growth at 14 – 25%
- Technology Viability
 - 2 rounds of Small Wind Independent Testing
 - Considering Mid-size turbine development – likely to be through 2013
- Technology Acceptance - WPA
 - Small wind market and outreach to stakeholders – increase DW deployment
 - Initiate new demonstrations of small wind – expand market

Residential Small Wind Incentives

www.dsireusa.org



Property Tax Incentives
 Income Tax Credits

RPS

Puerto Rico \$

BUYDOWNS/GRANTS	PRODUCTIVITY INCENTIVES	MINOR INCENTIVES
Buydown/Grants	Productivity Incentives & Loans	Loans
Buydown/Grants & Net Metering	Net Metering, Loans & Prod. Incentives	Net Metering & Loans
Buydown/Grants, Net Metering, & Loans	Net Metering & Prod. Incentives	Net Metering

Future state incentive in development – IN, CO, OR, CT, LIPA

- Consumers tend to live in their homes on an average of 7 years – need to meet that payback
- Increasing energy (gasoline, home heating oil, natural gas) costs motivate consumers
- Some consumers don't care about cost want independence from the utility grid
- Takes several years for consumers to make a purchase decision

AWEA Small Wind Turbine Global Market Study 2007

- 2400 SWT sold as of 12/31/06
 - 1476 by US manufacturers for US market
 - 909 by US manufacturers for non-US market
 - 15 by non-US manufacturers for US market
- Leading market – CA, NY, VT, MA, PA, OH, TX, ME & AZ
 - 51% rural or suburban homes
 - 19% farms
 - 10% small businesses
 - 10% schools or public facilities
- Priority states and activities – CA (zoning), NY (zoning), CO, MA (zoning), KS (net metering & rebates), MN (rebates, zoning), MI (rebates), ND (rebates), PA (rebates, zoning)

Diffusion of Innovation Theory

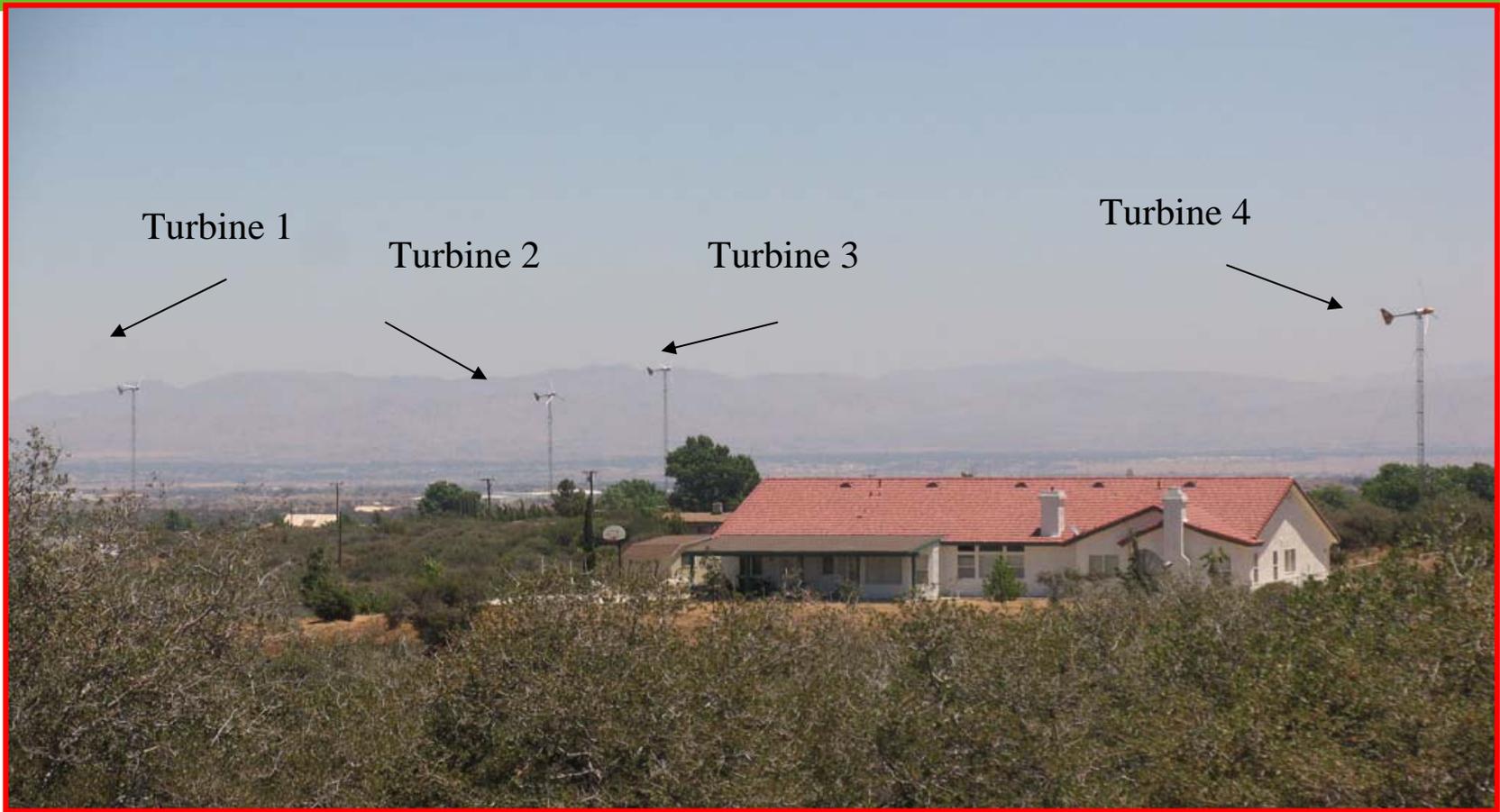
- Innovation attributes – that increase the rate of adoption*
 - Relative advantage – “the degree to which an innovation is perceived as being better than the idea it supersedes”
 - Comptability – the degree to which an innovation is perceived as consistent with existing sociocultural values and beliefs
 - Complexity – “the degree to which an innovation is perceived as relatively difficult to understand and use
 - Trialability – “the degree to which an innovations may be experimented with on a limited basis”
 - **Observability** – “the degree to which an innovation are visible to others”
- Perceived risk – impede adoption
- Other issues
 - Financial wherewithal to purchase or finance
 - Availability of support system
 - Must have importance in the view of the purchaser
 - Must be easily understood by purchaser
 - Product must be available through regular supply channels

*Rogers, Everett M. 1995 Diffusion of Innovations, Fourth Edition, New York: The Free Press



Rural Residential Market

Most installed in San Bernadino County

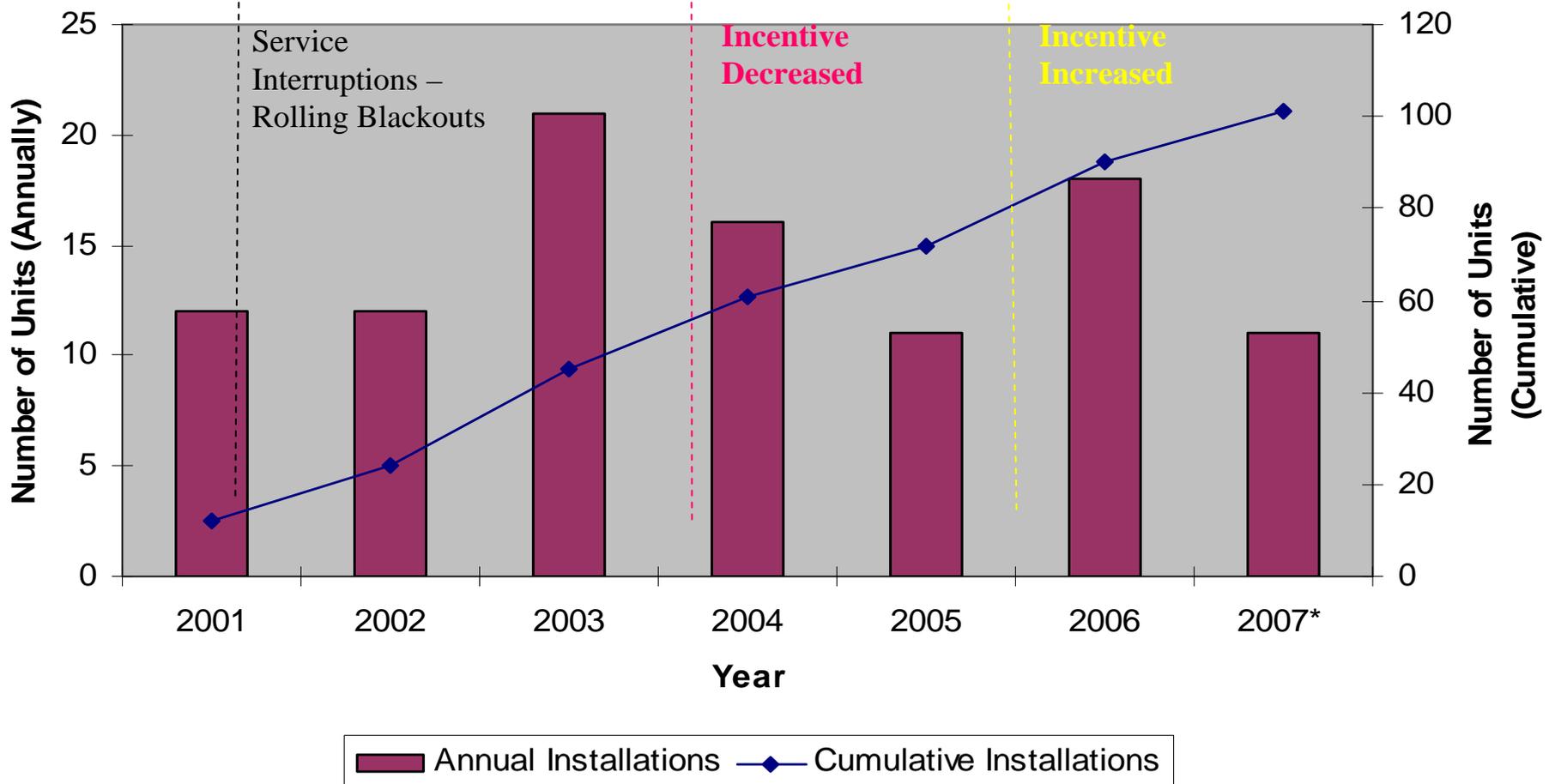


116 turbines installed to date (since 2000), good incentives, high electricity rates (43 cents/kWh Tier 3), suburban residents



Guasti Installations

SWT Installations (2001 - 2007)



* As of 3/07

Market Assessment Summary

Market Segments

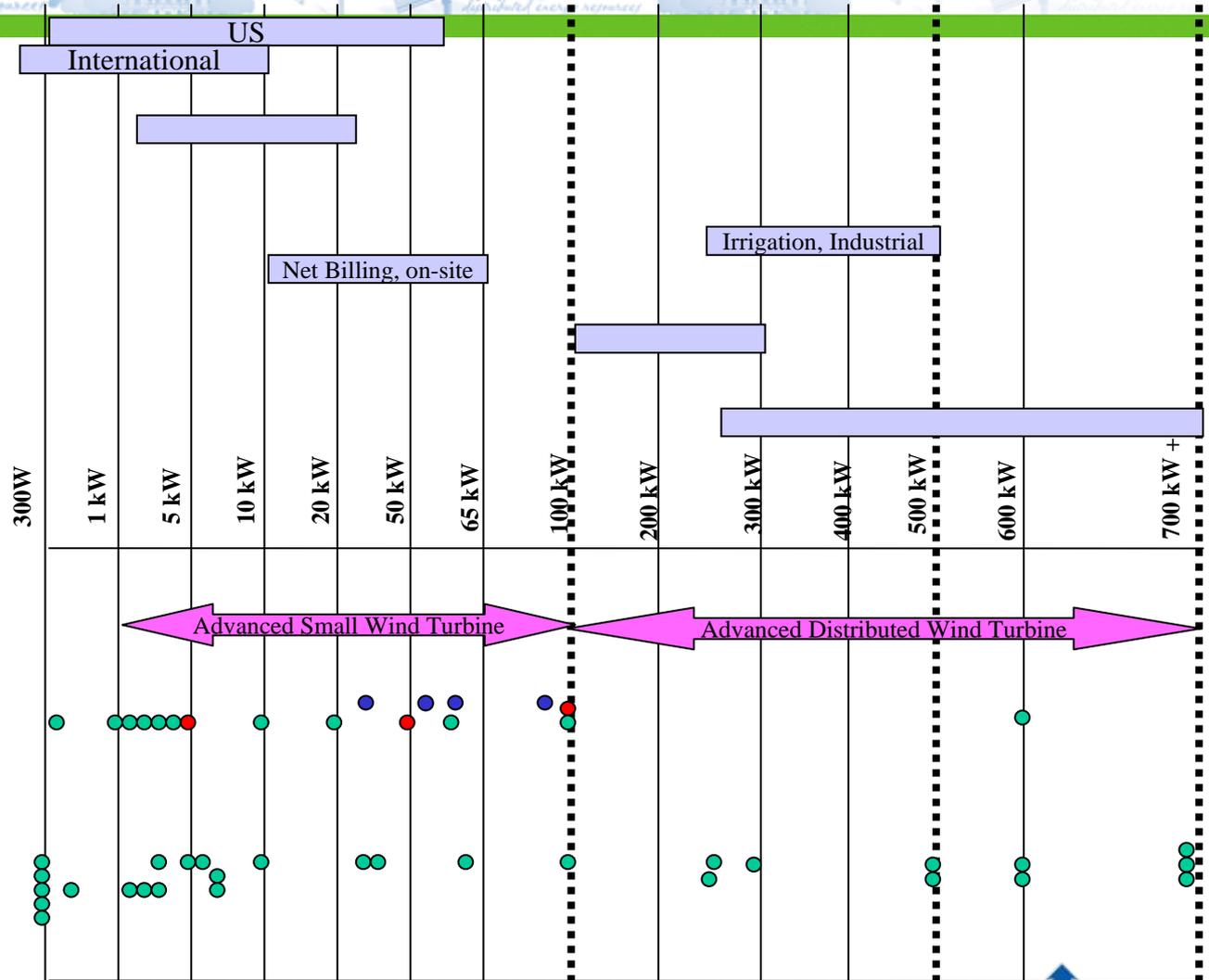
Small-Scale Remote Power

Residential Power

Farm/Business/Ind Power

Wind/Diesel Power

"Small-Scale" Community Power



DOE Size Categories

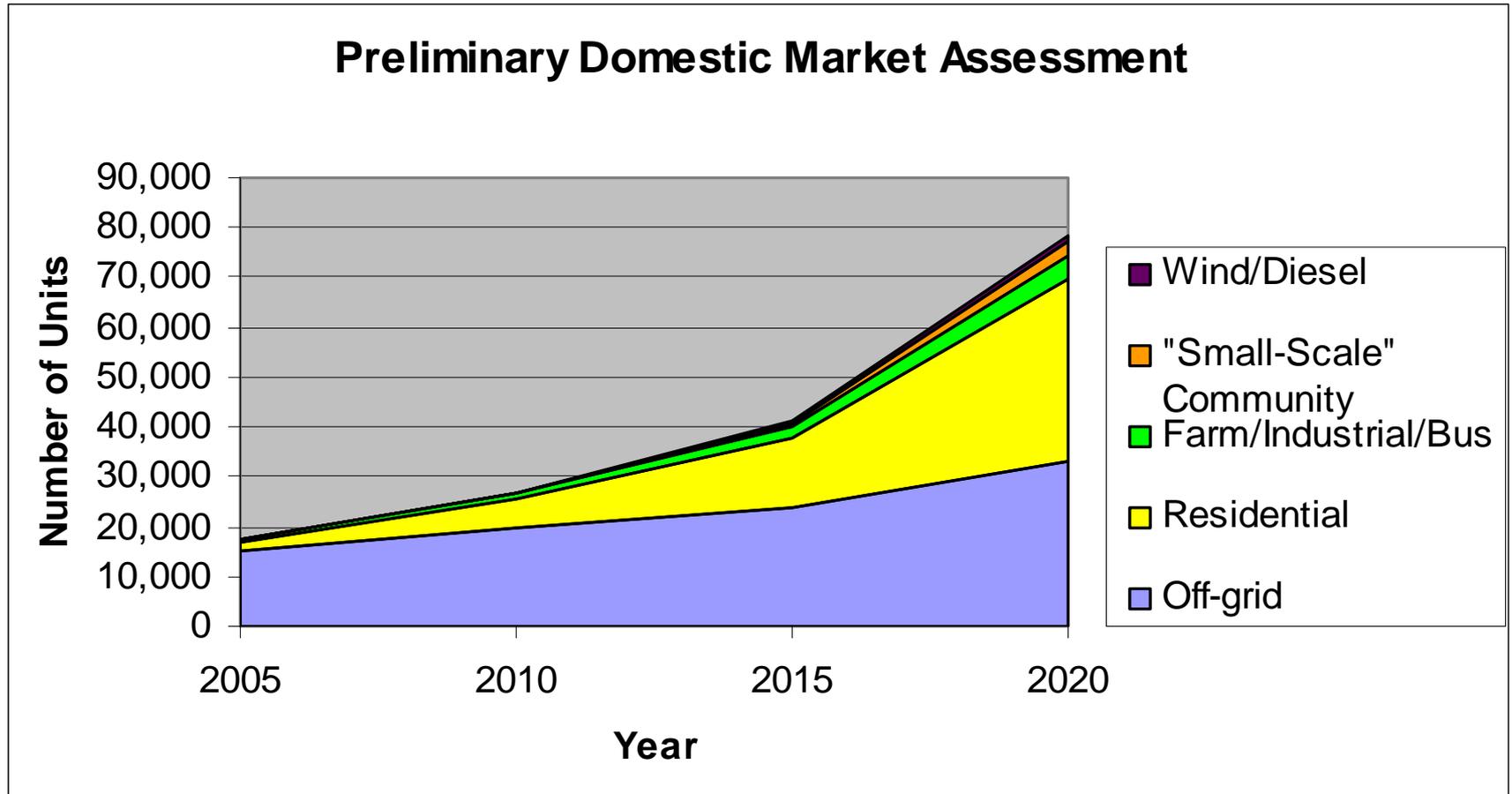
US Commercial Products

Non-US Commercial Products*

- Refurbished
- Commercial
- Prototype

* - Currently sold in the US

Potential DWT Market Applications Studies - # of units



In addition to a very strong international market



Potential DWT Market Applications Studies – MWs

Potential US MW Installed Capacity

