Lessons Learned from the U.S. Photovoltaics Industry: Implications for Distributed Wind

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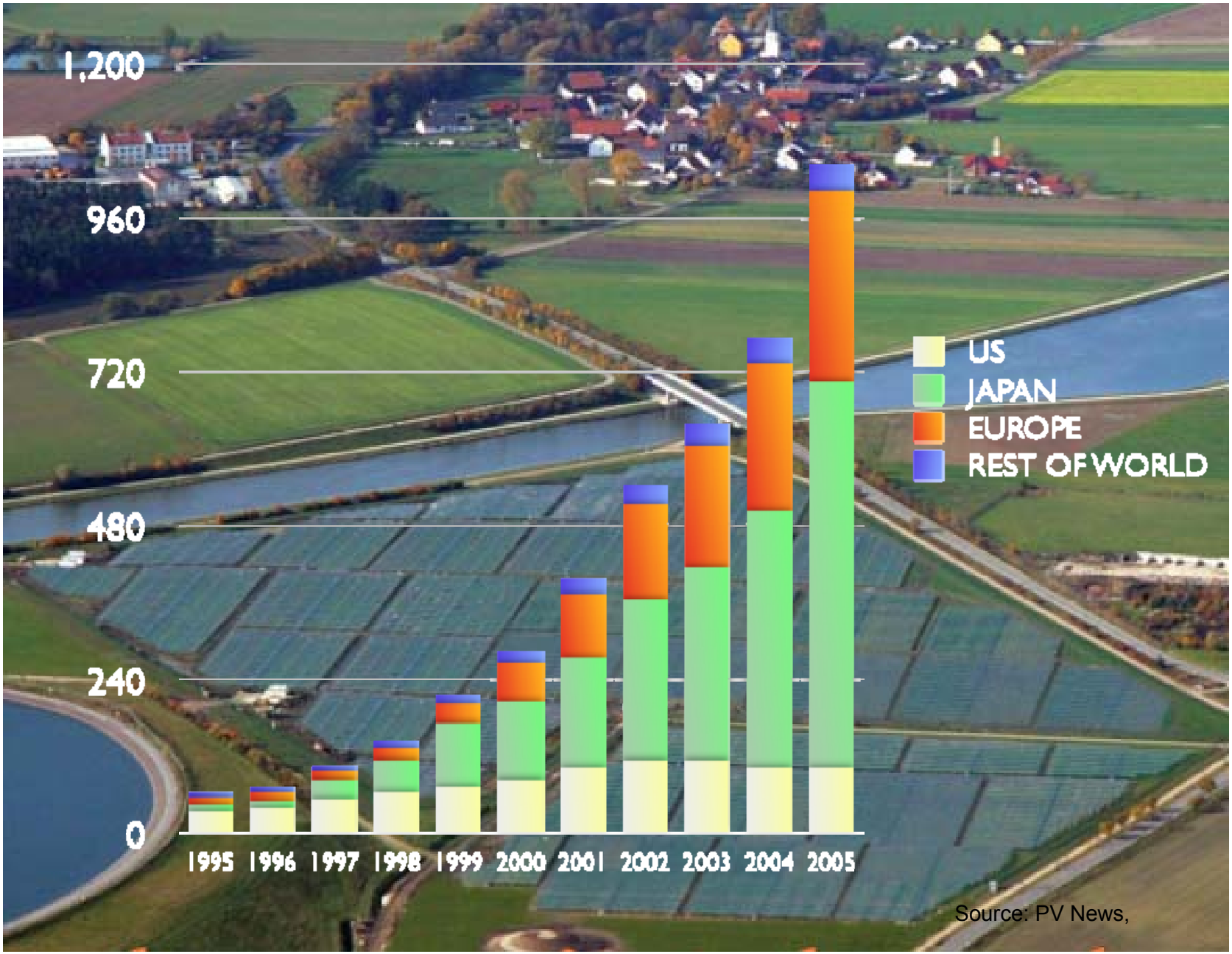
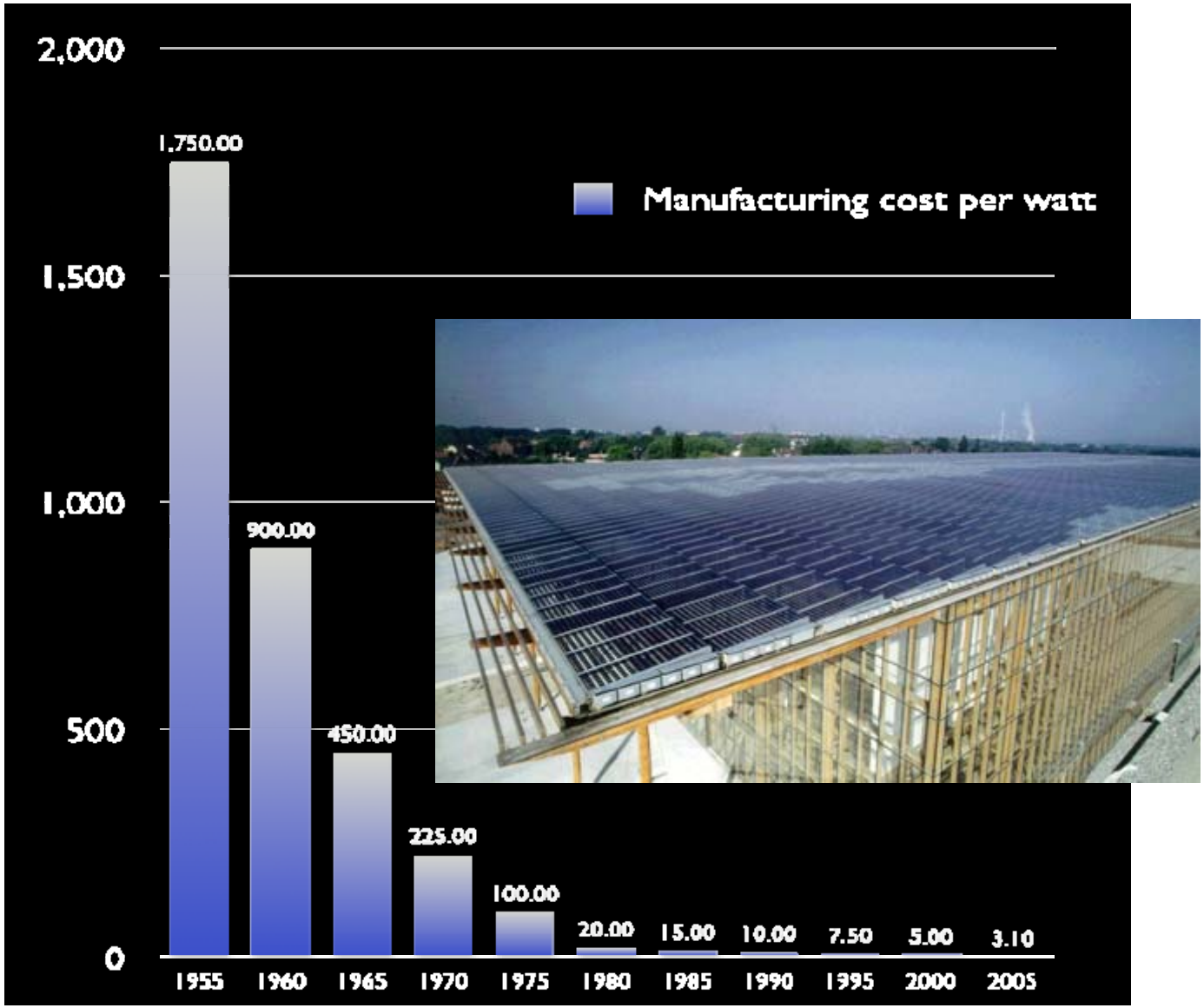
PV Production 1995 -2005



From “Our Solar Power Future: The U.S. Photovoltaics Industry Roadmap Through 2030 and Beyond”



PV in American Markets

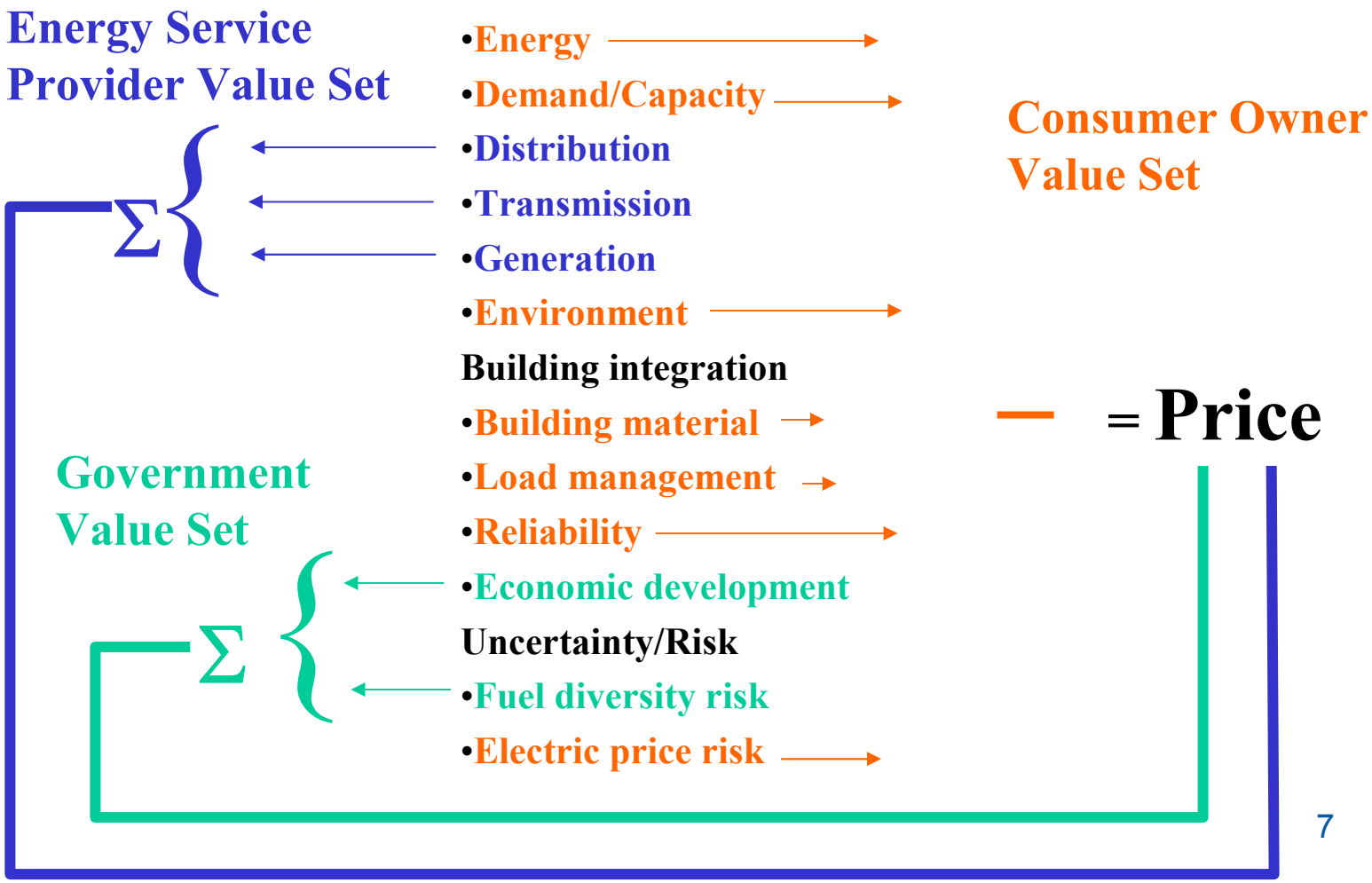
- More than 2000 solar installations (REPiS, 2003)
  - 36% Residential
    - Mostly CA, CO, and AZ*
    - High BTC in NY, IL, HI, NC, CA, NJ, MD, PA, VA, CO
  - 56% Non-residential (schools and government buildings)
  - 8% Commercial
    - Mostly CA, TX, HI, and IL*
    - High BTC in NY, MA, NC, CA, NJ, HI, MT, AZ, OR, RI
- Global nature of PV manufacturing
  - Historical U.S. dominance gone forever
  - U.S. Wind holds the dominant part of world market
- PV dealer/distributors often deal in small wind: natural synergy at distribution level

* - Commercial Solar Energy Market Potential Study ECONorthwest Feb 2004

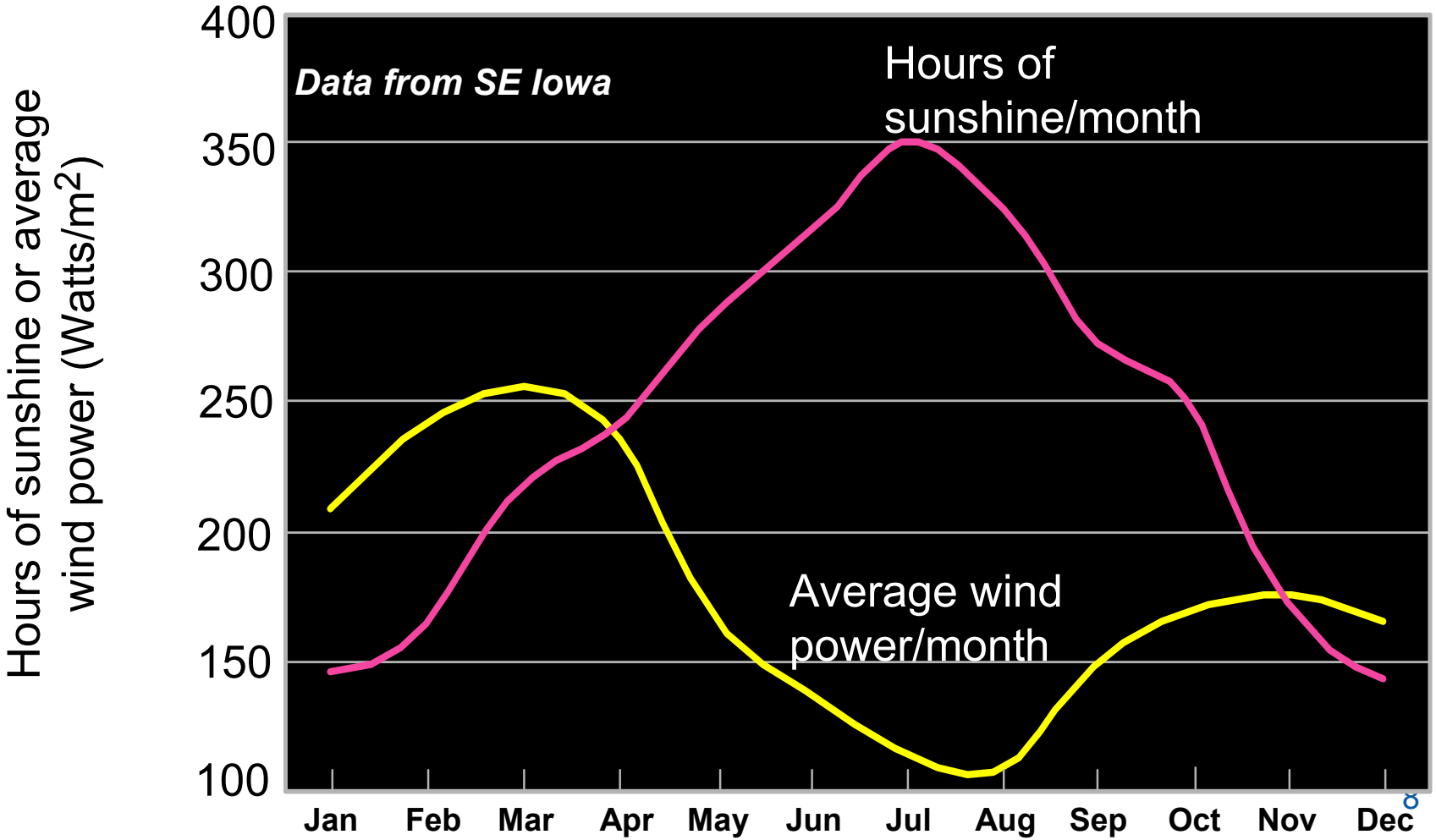
How Has PV Grown Market Share Despite Relatively High Costs?

- Grassroots advocacy to influence state and local policy
- Communication networks
  - Early links to electric utility industry, State Energy Offices through IREC
  - "*NCPV Hotline*": link to industry, NGOs, govt. decision-makers
- "Schools Going Solar" program
- Strategies to work with, create other government programs
  - State Energy Offices
  - CSTRR
- Consumer appeal of personal control of electricity
  - Comparative ease of PV installation
  - On retail side of meter

Stakeholders Invest When Sum of Values Exceeds Price of PV



PV and Wind Resources are Complementary – seasonally and daily



DOE's PV Initiatives

- **Goal:** Increased deployment of PV technologies
- **Approach**
  - PV4U: electric utility integration issues
  - Million Solar Roofs: grassroots approach to elimination, mitigation of market barriers to rooftop solar technologies
    - More than 930 partners nationwide at program conclusion
  - Solar America Initiative (proposed, 2006)
    - Two parts: R&D and "Technology Acceptance" (deployment)
    - Proposed 9-year duration
    - Focus: urban infrastructure
    - Goal: cost competitive with conventional grid electricity by 2015
    - Focused on commercial PV
- **Opportunities for Small Wind**
  - Link with existing MSR partner network
    - Expand existing pilot work started with Northeast MSR partners
    - Develop wind version of *NCPV Hotline*

PV in Schools: 2.7 MW installed (REPiS 2003)

- **Goals:** Capitalize on multiple opportunities of school settings: (1) Education mission: educate students and, by extension, their parents; (2) Technology visibility (schools as community hub); (3) Energy security (schools as emergency shelters)
- **Approaches**
  - "Schools Going Solar" www.irecusa.org/schools/
  - New York's School Power Naturally www.powernaturally.org/Programs/SchoolPowerNaturally
  - Florida's SunSmart Schools Progam benefits
- ***Opportunity for Small Wind***
  - Comparative "sexiness" of small wind
    - "Watching PV is just as exciting as watching toast brown"
  - Low cost using commercial micro-turbines

PV Zoning

- **Goal:** Reduce "hassle factor" of PV installation
- **Approach**
  - PV in Seattle ruled "outright use"
  - Place articles about zoning issues in trade journals
  - Work with Homeowner's Associations for PV acceptance
    - MSR project
- **Opportunities for Small Wind**
  - Develop articles for variety of trade and professional journals
  - Work with SEPA
    - Communicate with utilities interested in distributed generation

PV Approach to Net Metering

- **Goal:** Reduce hassle factor
- **Approach**
  - Drop net metering requirement for systems 10 kW and less
    - Excess capacity unlikely in smaller systems
  - Use net metering policy as step toward standardized interconnection
- **Opportunity for Small Wind**
  - Work with PV industry to develop standardized interconnection standards
  - Acquire larger cap limits for net metering
  - Link with biomass

PV Certification/Training

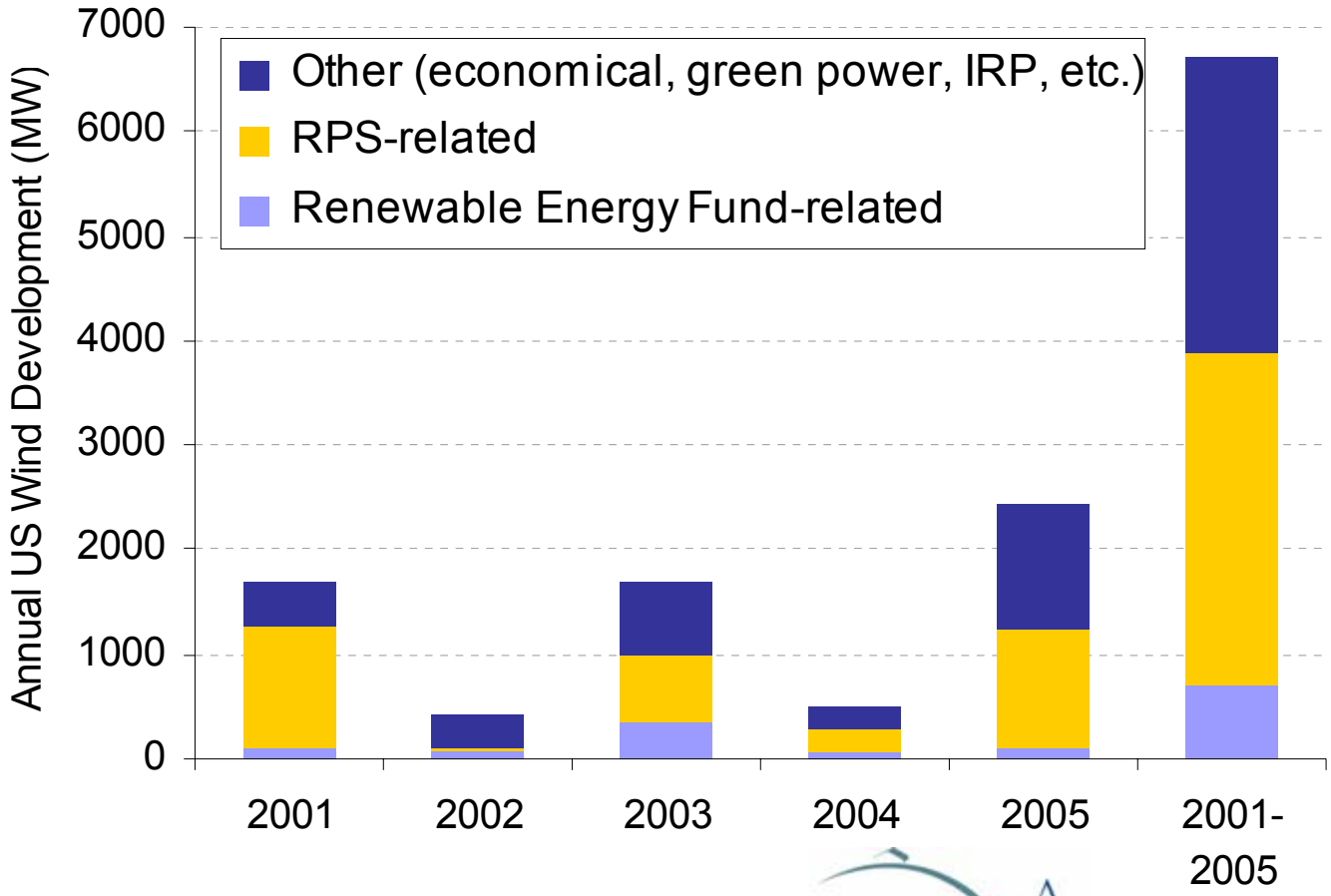
- **Goal:** Establish credibility with consumers
- **Approaches**
  - NABCEP installer certification:
    - Voluntary
    - Too soon to assess market impacts
    - All states do not recognize NABCEP certification as legitimate alternative to their own process
  - IREC Workforce Training efforts
  - No PV hardware certification program yet
- **Opportunities for Small Wind**
  - Wind has IEC standard and draft AWEA standard – need SWT standard
  - NABCEP Wind Installer Certification in development
    - Integrate manufacturers training with NABCEP certification
  - Workforce training through community colleges

Different PV Policy Incentives

- **Goal:** Grow market share
- **Approaches**
  - Federal Investment Tax Credit – combined incentives increase economic benefits
  - Production Incentive:
    - Market-driven
    - Works well for organizations with fiduciary responsibilities
    - Consumer function as utility and then become advocates for properly aligned incentives
  - New RPS policy with solar set-aside or increased credit for solar
    - DG technologies sometimes shut out by utility-scale wind
- **Opportunity for Small Wind**
  - Partner with DG advocates to adopt all DG technologies on inclusive federal and state policies
    - FITC, RPS, and PI

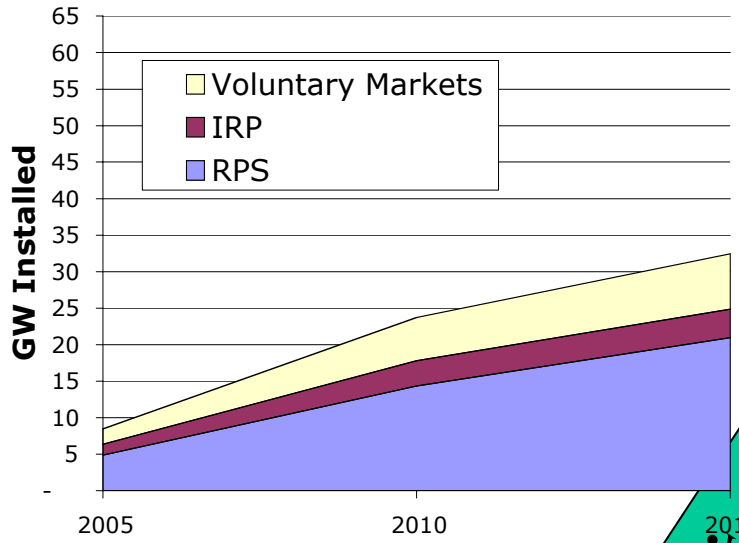
Current Renewable Energy Market Drivers in the United States

- Renewables Portfolio Standards
- Renewable Energy Funds
- Federal and State Tax Incentives
- Green Power Markets
- Integrated Resource Planning



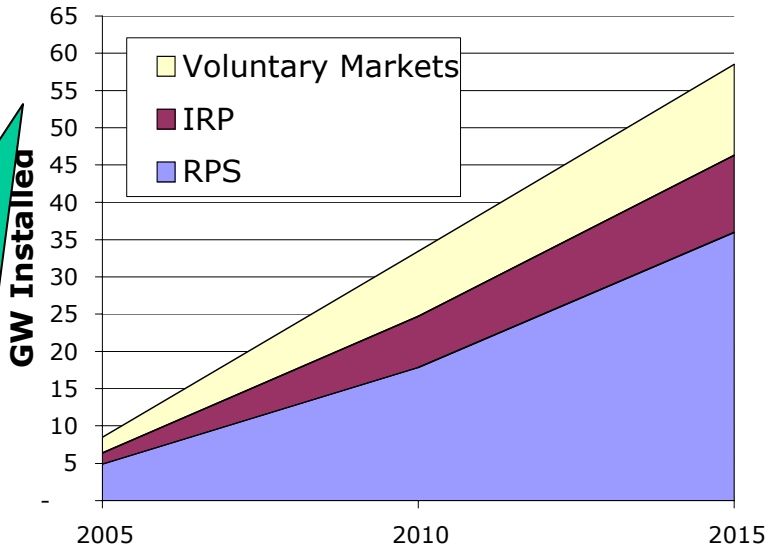
RE Electricity Opportunities

Expected RE Capacity by Driver



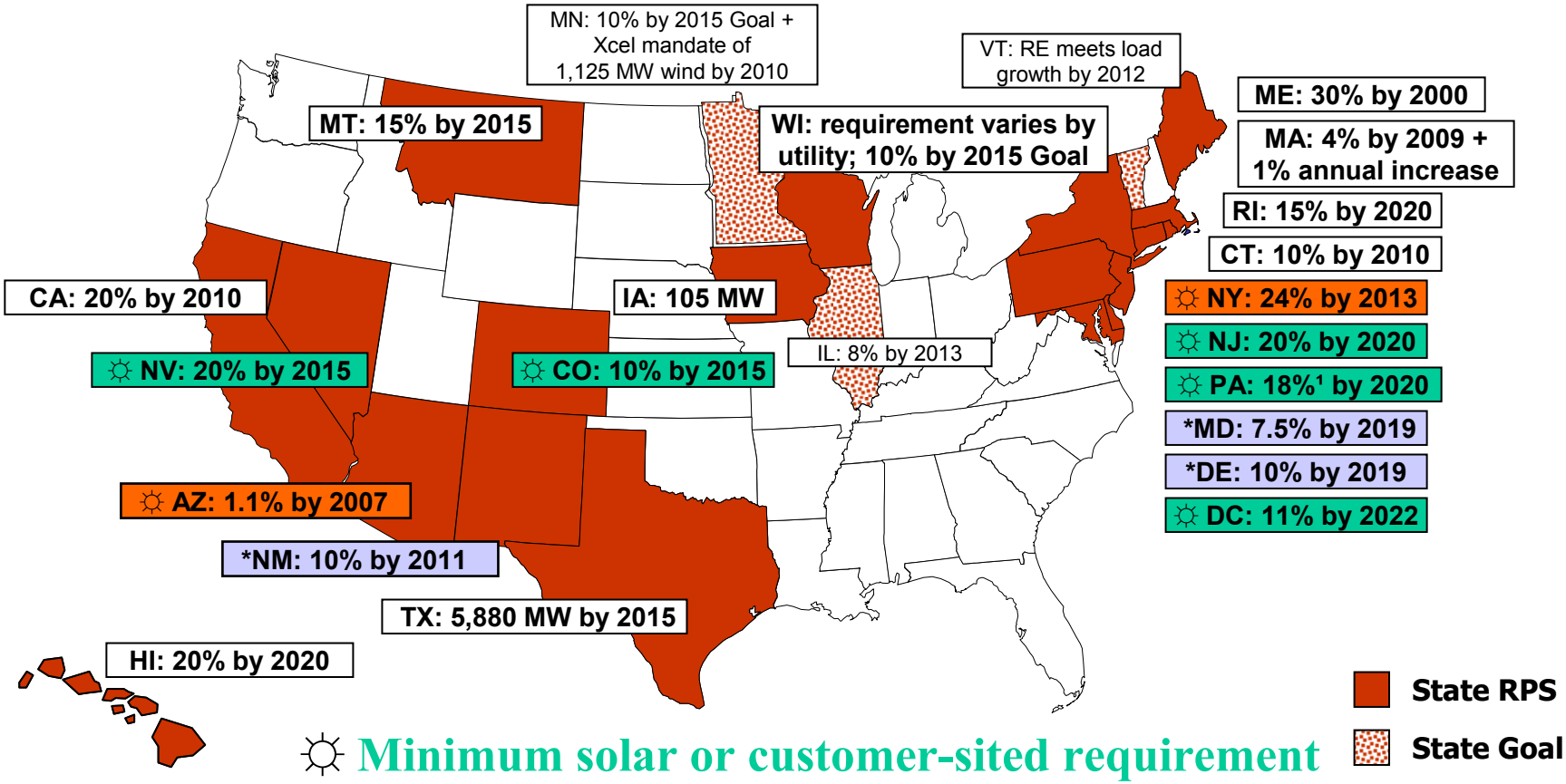
Policy Opportunities
- RPS Expansion
- IRP
- Voluntary Programs

Accelerated RE Capacity by Driver



Achieving up to $50B of Additional RE Investment in 2015

Renewables Portfolio Standards



☼ Minimum solar or customer-sited requirement

•Increased credit for solar

Minimum wind/solar requirement

DSIRE: www.dsireusa.org April 2006

Missouri Department of Natural Resources

Opportunities for Distributed Wind

Messaging

- Aggregate DG to include small wind, solar thermal, PV, others
  - May facilitate coalition-building
- Categorize small wind as energy efficiency
  - Systems under 10 kW do not meet total needs of household
  - Unlike EE, small DG has measurable results
  - Either define as conservation measures or supply-side resource
  - Consider defining DG by scale and ownership instead of technology

Future Opportunities

- **Industry**
  - Develop package products for consumers that are simple and use multiple technologies
  - Work for mutually beneficial DG inclusive policy
    - Federal Investment Tax Credit
    - RPS set-asides and extra credit for DG
    - Productivity incentives
    - Standardized national interconnection

Future Opportunities - 2

- **Government**
  - Economic tools across DG (wind, PV, solar thermal, biomass, etc.)
  - Federal role – help communicate about what's happening with DG across state boundaries
  - Write articles NACO journals to get information out about zoning
  - Develop "value" proposition for distributed wind
  - Wind for Schools program (see poster on NREL pilot project – M. Kelly)
  - Working with state utility regulators to incorporate DG as part of IRP
  - Continue to work market barriers such as zoning – defined guidelines in place – help minimize consumer hassle factors
  - Facilitate small wind on government procurement lists

Future Opportunities - 3

- **Advocacy**
  - Develop new consumer group conversant on DG
    - SEIA unable to support small wind in Colorado
    - Need a new group without history of supporting one DG technology
    - Operate with foundation funds
  - Build constituency by developing production incentives (PI) that turn consumers into political interest group by making them the utility
    - PI are beneficial since they are market-driven, ensure long-term production, and lessen probability that U.S. incentives will add a roller-coaster effect to the market like the '80s
    - PI works well for organizations with fiduciary responsibilities
  - Once regional/state advocacy groups matured – work on reducing hassle factor; e.g., zoning policies

Future Opportunities - 4

Joint

- DG industries need to work together
- Bring robustness to the DG industry through hardware performance certification
  - Develop standards and certification protocol
  - Form a Distributed Generation Certification Corporation
- Need side-by-side strategies to develop utility sector and educate consumers on energy
  - Can't rely on one-on-one communication; need to develop information through various channels