

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

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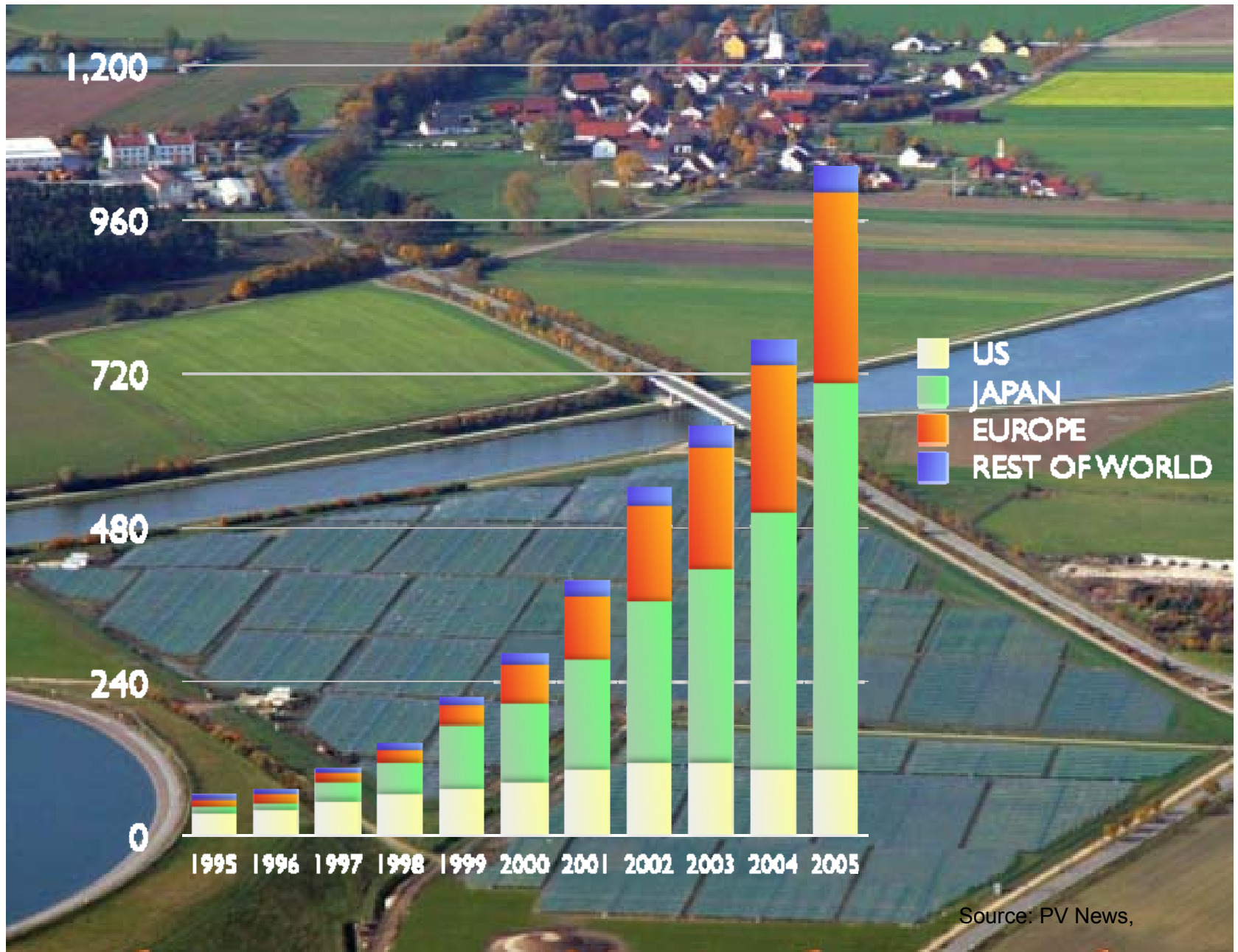
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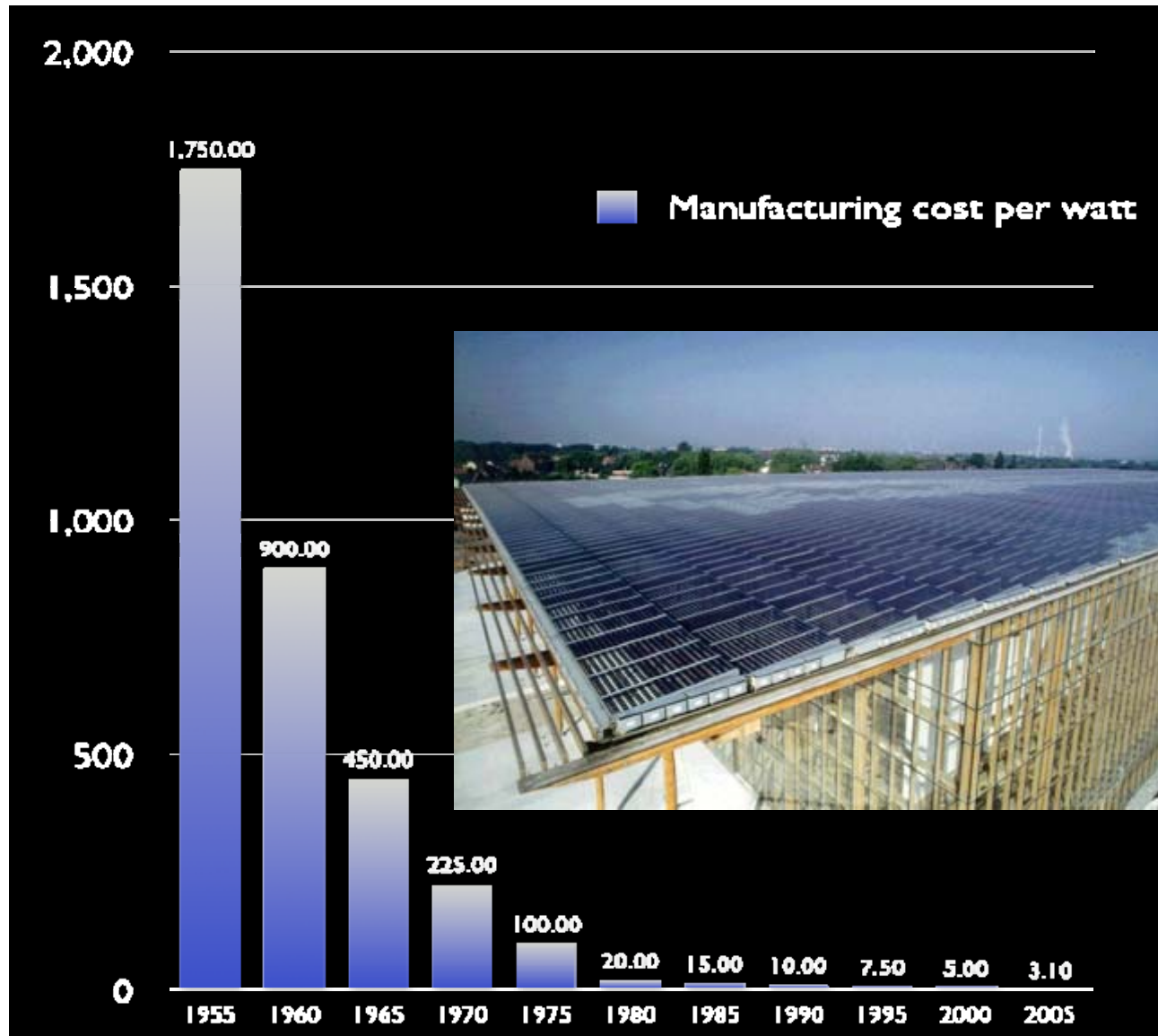
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PV Production 1995 -2005



Source: PV News,

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



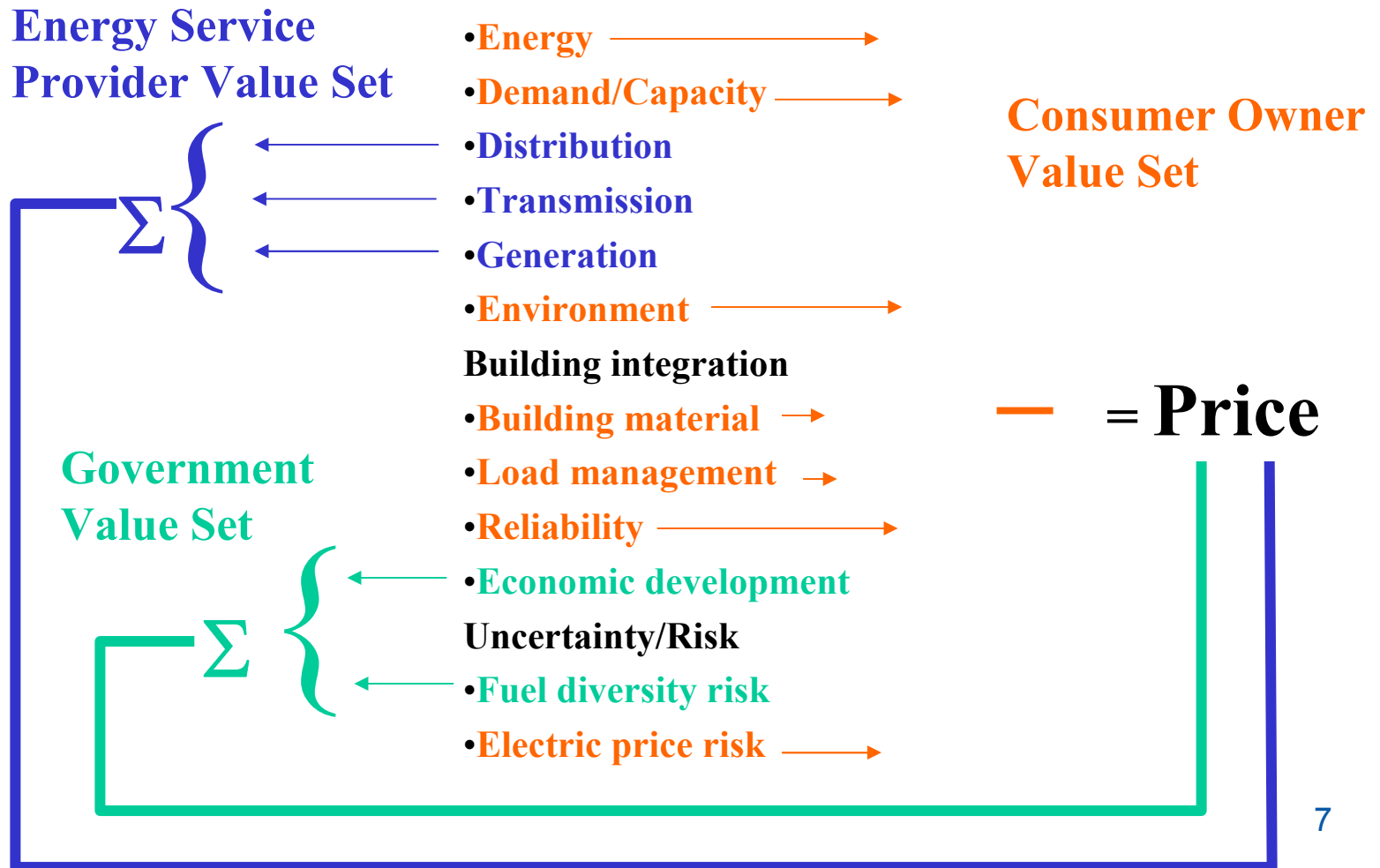
PV in American Markets

- 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

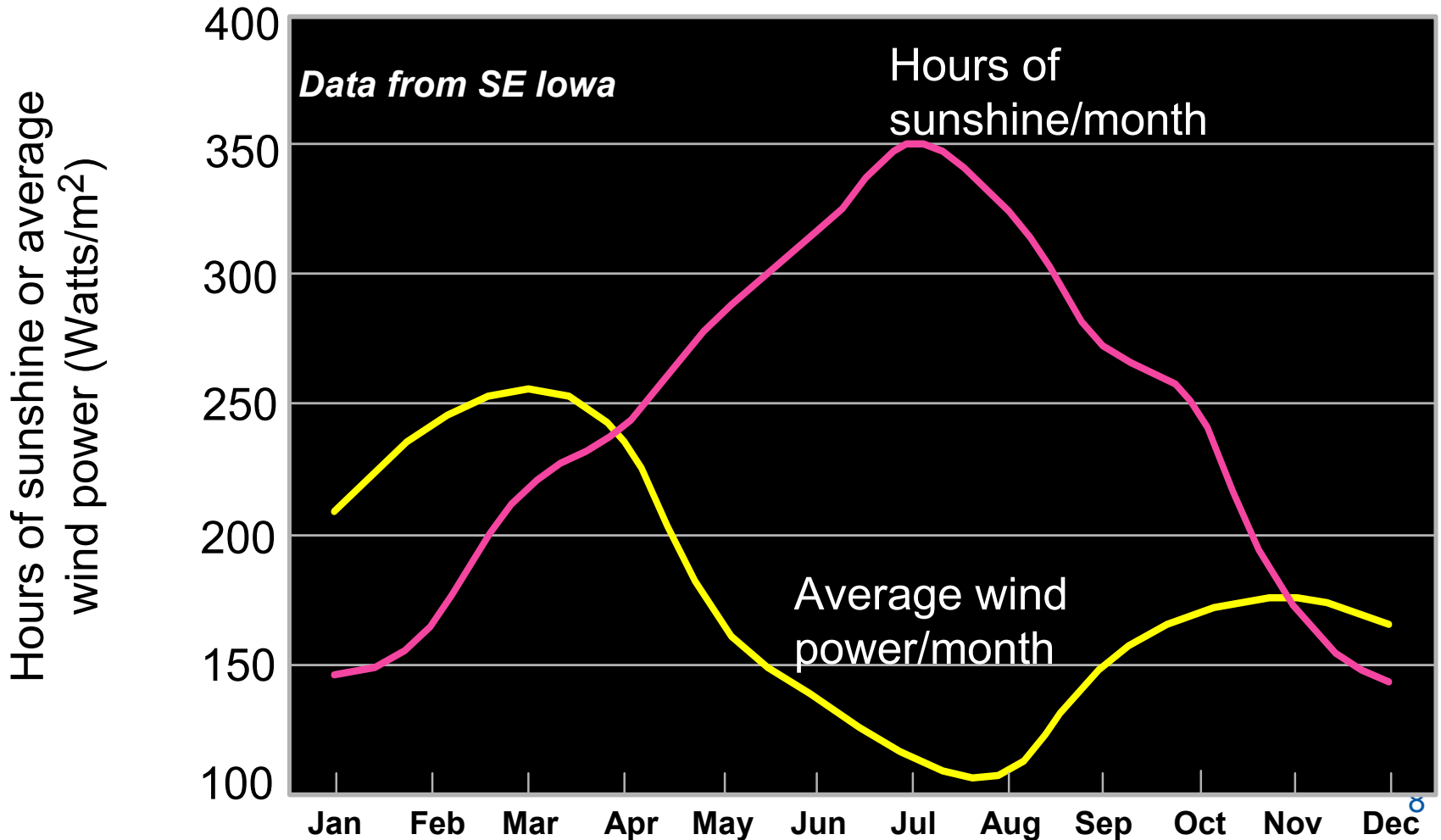
How Has PV Grown Market Share Despite Relatively High Costs?

- 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 9
 - 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 Program 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

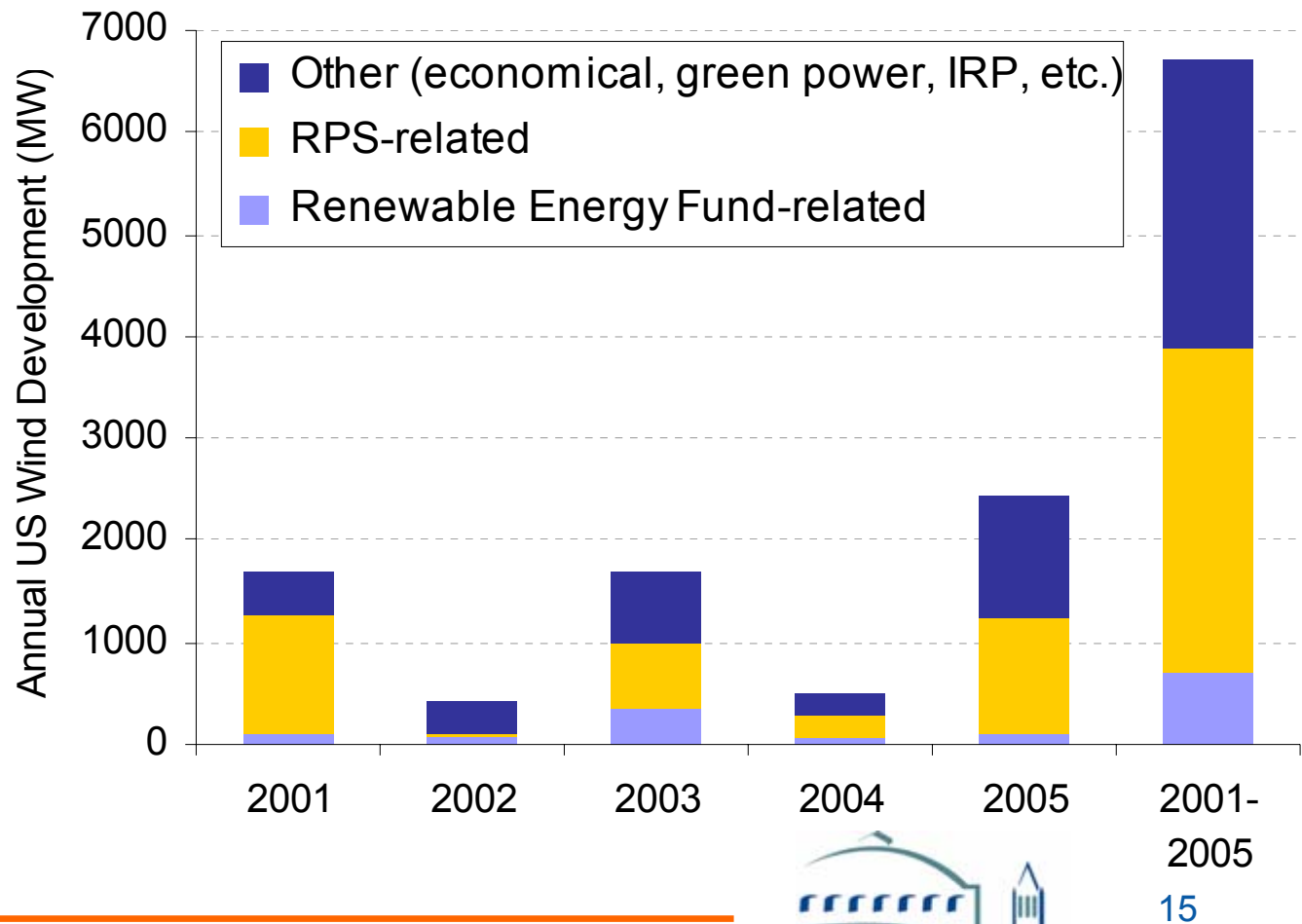
- **Goal:** Establish credibility with consumers
- **Approaches**
 - NABCEP installer certification:
 - Voluntary
 - Too soon to assess market impacts
 - All states do not recognize NABCEP certification as legitimate alternative to their own process
 - IREC Workforce Training efforts
 - No PV hardware 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

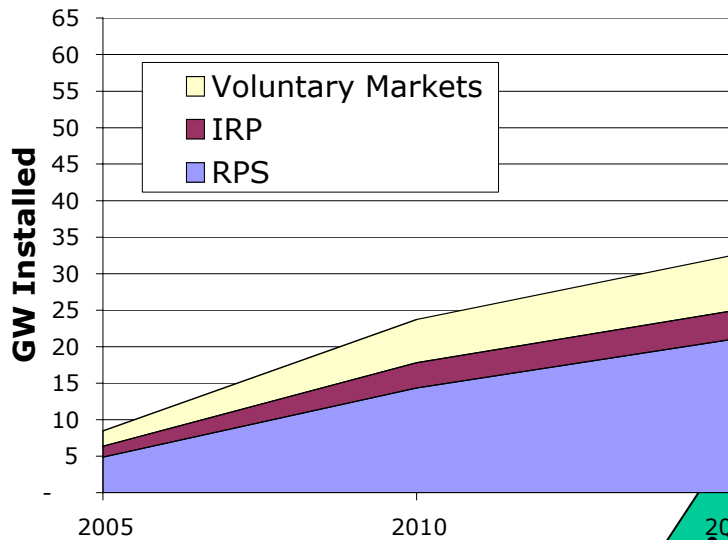
Current Renewable Energy Market Drivers in the United States

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

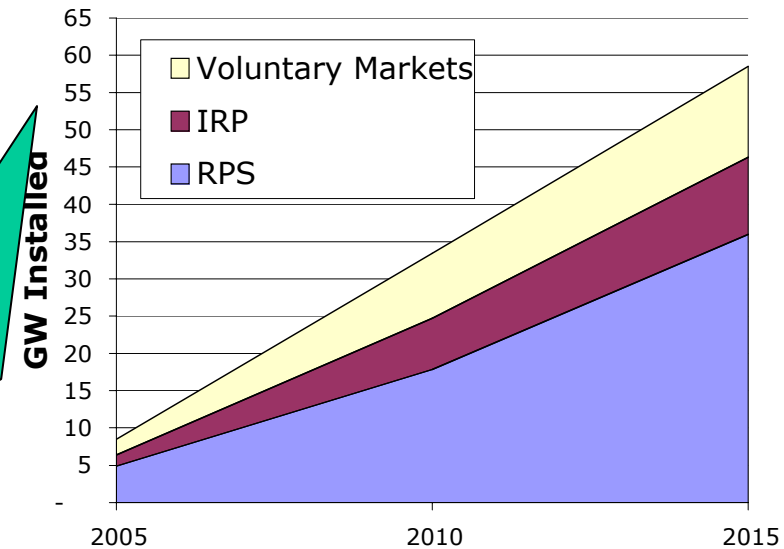


RE Electricity Opportunities

Expected RE Capacity by Driver



Accelerated RE Capacity by Driver

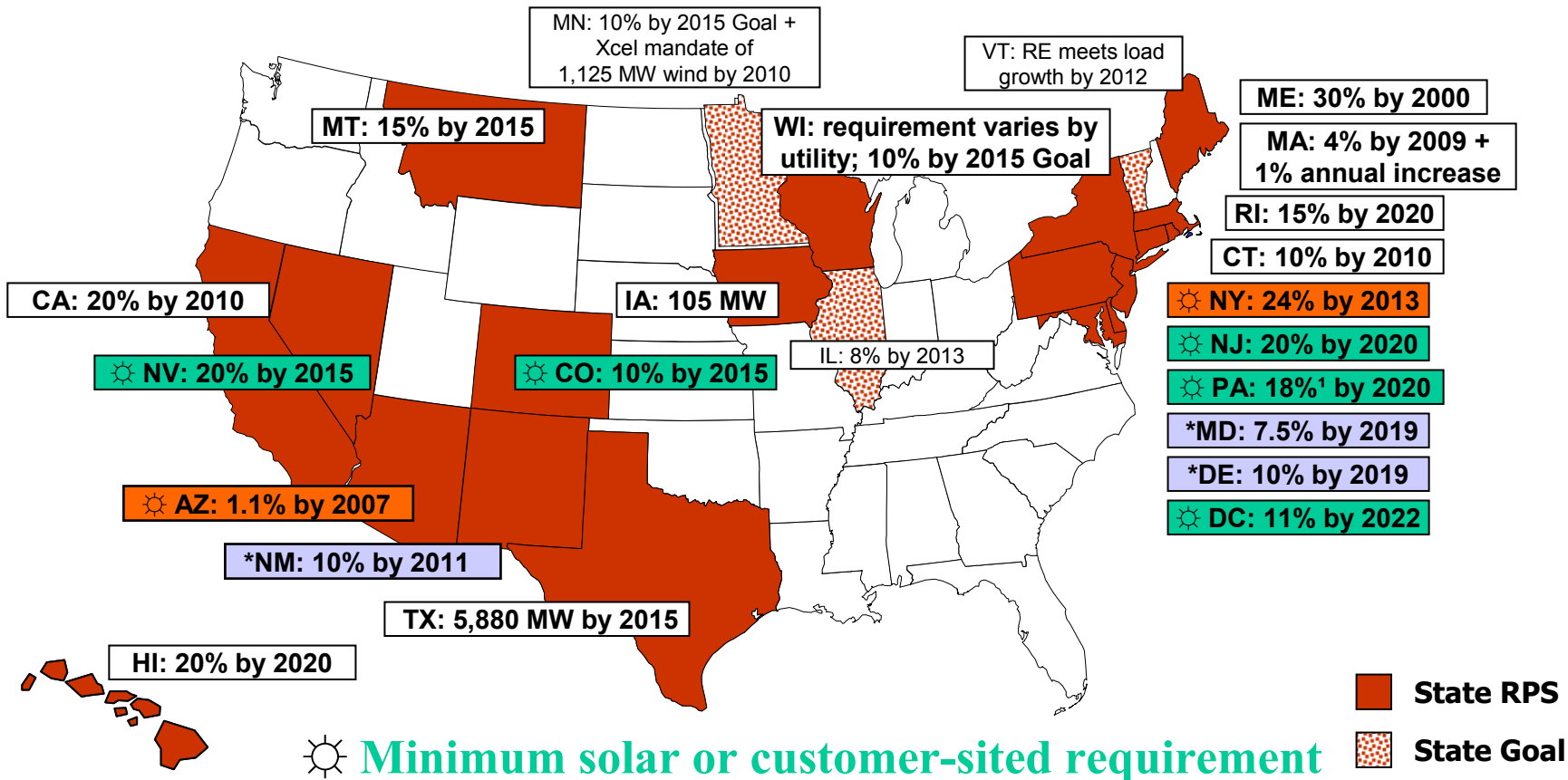


Policy Opportunities

- RPS Expansion
- IRP
- Voluntary Programs

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

Renewables Portfolio Standards



DSIRE: www.dsireusa.org

April 2006

17



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

